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Electrical World

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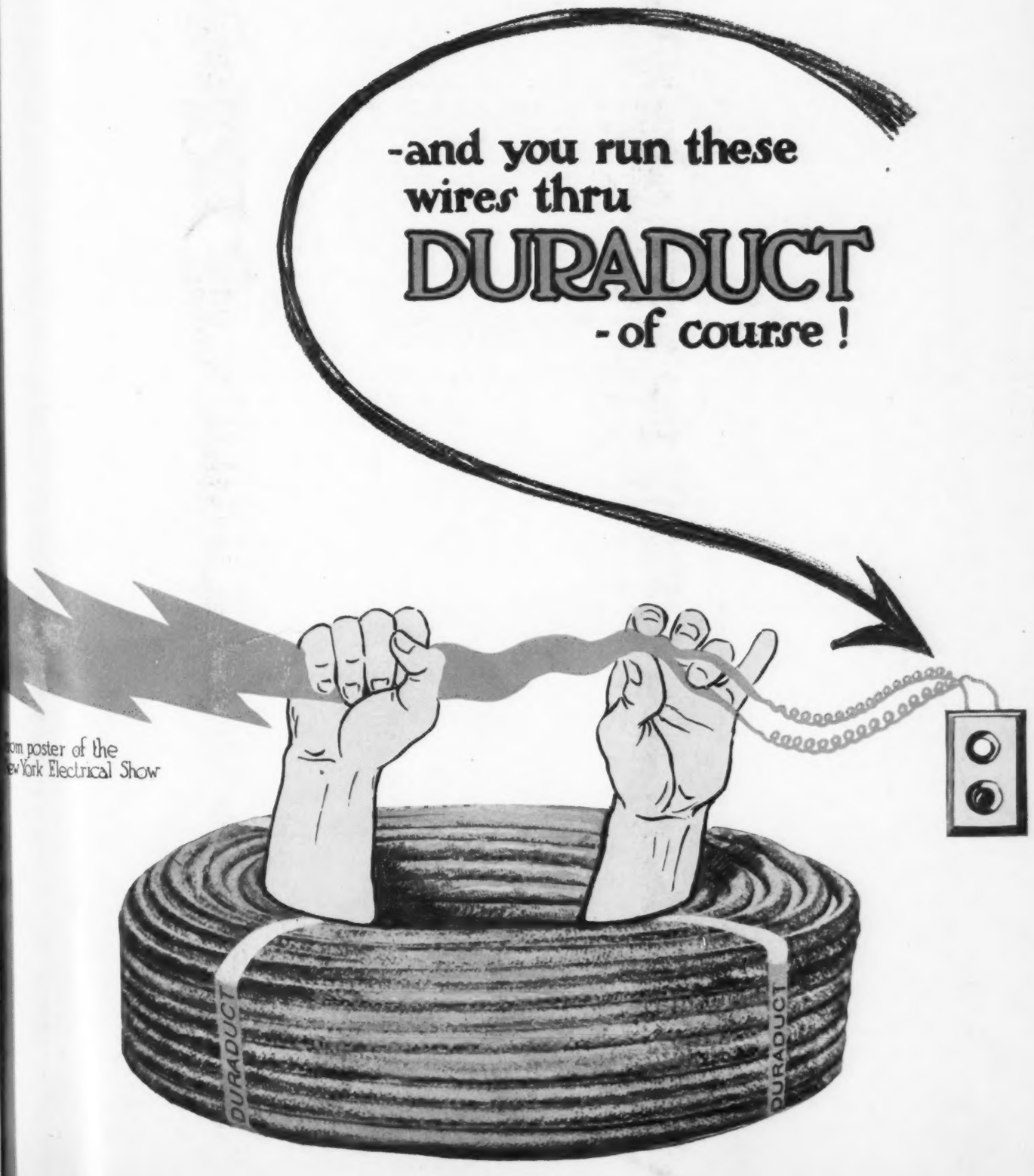

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Electrical World

New York, Saturday, October 1, 1921

The Great Issue Now Before All Our Associations

MEN have a way of joining associations, to express approval and to lend support, and then doing nothing more. Every society and association in the electrical industry is suffering from this abandonment by members—due to failure to realize what such an association is and what it is for.

The N.E.L.A., the A.I.E.E., the S.E.D., the I.E.S., the N.E.C.A., the E.S.J.A., the A.M.E.S., the Power Club, etc., are simply associations of men who have banded together in the effort to achieve through co-operation some purpose that they feel cannot be accomplished by the individual. Each man has joined because this league or that society is striving to do something that he wants done. He is received as a member because he thus expresses a desire to help, and as a member he stands voluntarily committed to contribute his active aid. The act of joining in no way fulfills his obligation. No member can conscientiously sit back and wait for the secretary or the headquarters staff to do the work.

But men are just as human in association work as in anything else. They do largely what they like to do and apply themselves to the thing that interests them most at the time. If they are to take part in association work, it must be made not only worthy but timely and appealing. And just as soon as an association ceases to have such clearly defined objectives and to make real progress toward their attainment, that association is dead. For it can flourish only on the interest, the active unity and influence of its membership. And it justifies itself only in the measure of the practical service which it renders broadly to the industry as well as to the individual, along lines that do not duplicate and overlap the work of correlated bodies.

Electrical men believe in co-operation, and they have grouped themselves into a number of associations of large membership and great potential strength that have done some very big and useful things for the advancement of the industry. They have accomplished but a fraction of the good they could have done, however, if their collective purposes and influence had been expressed more actively to the individual members and applied more intimately by them in their local contact. Most members abandon their associations only because the association fails to sustain their eager interest and gives them work to do.

The ELECTRICAL WORLD believes that there is no more urgent issue before our associated bodies than this one. The member *must* be made to appreciate that he is the association; the association itself must employ its membership with more purpose and effect.

Matthew Scott Sloan

An engineer who has achieved early distinction among leaders in central-station-company affairs through his qualifications as an executive and a sympathetic understanding of public relations has been elected president of the Association of Edison Illuminating Companies.

AT ITS recent annual meeting in Spring Lake, N. J., the Association of Edison Illuminating Companies elected as its president a man young in years and young in the Edison group. These companies, which are generally recognized as the leaders in electric light and power company policy and engineering practice, date back from the early days of the commercial use of electricity. To become the spokesman of this group, therefore, stamps one as a leader among leaders. M. S. Sloan, president of the Brooklyn Edison Company, the new president of the Edison association, has been engaged in the public utility business for the last fifteen years. By education and by early training he is an engineer. By instinct and inclination, however, he is an executive. Possessed of a keen perception and sympathetic understanding of public relations, he has shown a marked ability to analyze those situations in the operations of a public utility which frequently pass unobserved and prevent a company from making the most of its opportunities. However, he has the courage to apply the needed corrective measures. In addition, Mr. Sloan has a clear understanding of utility financing and has as a result been able to be of considerable assistance not only to his own company but also to bankers and others interested in the issuance of public utility securities. In recognition of this understanding he has been appointed chairman of the N. E. L. A. committee on relations with bankers. A Southerner by birth, nature has endowed him with an attractive personality, making it easy for him to meet other men and win them over to his point of view.

Mr. Sloan was born in Mobile, Ala., Sept. 5, 1881. In 1901, before he had actually reached his twentieth birthday, he was graduated from the Alabama Polytechnic Institute at Auburn. It was in 1906 that he left the General Electric Company to enter the utility field as chief engineer of the Birmingham (Ala.) Railway, Light & Power Company. Later he was made assistant superintendent of the lighting and power departments of that company, and in 1907 he was appointed superintendent of power. The following year he was appointed superintendent of the company's electric department, with jurisdiction over the operation and commercial sales of that department. In 1910 he was made assistant to the president of the company, in which capacity he had supervision over all departments, with full executive power. Toward the end of 1913 he became connected with the New Orleans Railway & Light Company, an affiliated property, as assistant to the vice-president. A few months later he became manager of that company's railway and electrical departments, and in 1917 was elevated to vice-president and general manager. Within a short time, however, he resigned to join the executive staff of the New York Edison Company as assistant to Vice-president John W. Lieb and in that capacity became operating manager of the company. In the summer of 1919, upon the resignation of Nicholas F. Brady, he became president of the Brooklyn Edison Company.

Mr. Sloan has been a conscientious association worker, and while he lived in the South he was a bulwark of strength to the Southeastern Section of the N. E. L. A. In addition to his N. E. L. A. work previously mentioned, he is chairman of the committee on electrical resources of the nation and he also is a member of the public policy committee.

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All Eyes on the Washington Employment Conference

NO UNOFFICIAL body meeting under official auspices in recent days has attracted a larger measure of public support than the conference on the employment situation that has met in Washington at the President's call this week. Employers great and small, workingmen employed and idle, professional men, clerks, wives and children—all would hail its outcome if it meant that the way was clear for a resumption of the industrial activity of two years ago. The conference cannot work miracles or by a wave of its wand restore the sick to bounding health. But it can at least clear the way. It can produce an accurate census of the unemployed by sections, cities and industries; it can marshal for demolition the obstacles in the way of "starting up," and all patriots will hope that it can bring together for prosperity in peace as they were brought together for defense in war the leaders of capital and the leaders of labor.

Who Should Develop the Colorado River?

WHAT agencies should be the ones to develop the tremendous power possibilities of the Colorado River? How is the financing to be done, who should supply the funds, and how should these be repaid? How should the power be distributed? How should the flood control and irrigation benefits relate to the power development? These are the fundamental questions which must be answered before anything further can be done toward realizing upon this great asset of the Southwest which flows through Nevada, Arizona and Utah.

The recent statement credited to Secretary of the Interior A. B. Fall that "no dam should be built on the Colorado River by any agency except the federal government, as the enterprise is altogether too large, too important and involves too many interstate and international problems to permit of its being undertaken by any other agency," is of great significance. That the federal government is qualified to raise the funds for the construction of the necessary dams and power houses, and that of all agencies it alone can settle any interstate or international disputes which arise, goes without question. But is government to compete with private enterprise in work which private enterprise is eminently qualified to undertake? Present-day developments in power engineering and in the existing great transmission systems, outrivaling the proposed superpower system of the Atlantic seaboard fostered by the federal government, have reached their high plane under private initiative. These agencies also have been unusually successful in obtaining all the funds needed to extend their plants as power is demanded. The Colorado River developments offer no problems that cannot be solved by the same agencies that have been responsible heretofore for the country's electrical growth. There is no necessity for the government to develop the Colorado so long as private initiative equally resourceful and competent is willing to undertake the job.

The Effect of Increased Taxes on Rates

THE Senate committee dealing with taxation has indicated a possible change in the corporation tax section of the proposed act amending and simplifying the revenue act of 1918. Originally levying a tax of 10 per cent on the net earnings of corporations, the House committee increased this to 12½ per cent, and now the Senate committee proposes to increase it still further by making it 15 per cent. And all the while there is a clamor for a reduction in the price of freight and passenger transportation as well as in the rates for all public utility service. Apparently the work of the special taxation committee representing the electric light, railway and gas associations has been fruitless, or at least its warnings as to the effect of increased taxation on public utility corporations have gone unheeded. The public should be made to understand the full purport of such a change. Lower rates are out of the question if taxes are to be increased 50 per cent.

At Last True Figures on the Appliance Load

THE electrical industry owes a vote of thanks to C. J. Russell and T. W. Berger of the Philadelphia Electric Company for their study of residence kilowatt load with reference to relative consumption by appliances and lamps. Their paper, which appears in this issue of the ELECTRICAL WORLD, is a notable contribution to the common fund of knowledge, the first accurate analysis of what is really going on in the modern home in the matter of appliance use under actually existing conditions. It is particularly interesting and valuable because of its conservatism.

We have long known that the number of electric household appliances in service was increasing and that their habitual use was becoming more general. How this was affecting the load, however, and its worth to the central station have been matters for conjecture and theorizing. Now comes a study of the daily and hourly consumption of 1,332 households in Philadelphia, selected in groups in four different neighborhoods that provide an average well under what might be called the normally equipped home. Graphic wattmeters were

attached to the poles in circuit with the transformers serving these groups of homes and continuous readings were taken over a week's period. A survey was made of the appliances in use in each home. Although the test was made in the summer when appliances naturally have their minimum use, still the findings were surprising, for they prove that the total weekly consumption of residence appliances has already grown as great as the consumption for light; that on three certain days each week the appliance load is larger, while on the other days the light load is larger, and that this doubling of the consumption of energy has been accomplished with an appliance equipment averaging only two devices per house.

The report of this investigation has been presented before the recent convention of the Association of Edison Illuminating Companies and the meeting of the Great Lakes Division, N. E. L. A. It deserves the widest possible dissemination and the most thoughtful consideration. It raises plentiful questions that should be followed through. What are the facts in larger and smaller homes? What are the conditions in smaller communities and in other parts of the country? How will the comparison stand in winter, when both more light and more appliances are used? What can be done to increase the appliance load on Thursday, Friday, Saturday and Sunday? These are further facts for which the industry has vital need, and the Russell-Berger paper points the only way in which they can be developed. We have all talked about it long enough. Now let us find out what the actual conditions are in other cities. Such an investigation by any company can be made to pay for itself many times.

Effective Co-operation in Oklahoma

THE course followed in the recent movement to establish line construction rules in Oklahoma is a credit to the central-station and telephone interests involved. With a set of rules governing not only overhead construction but also inductive interference already issued in tentative form, the utilities came together in a joint committee and agreed on a recommendation involving the use of the National Electrical Safety Code for overhead construction. It was unanimously agreed that this was no time to consider the issuance of inductive-interference rules. The committee went before the commission with its recommendations and they were accepted.

We have had occasion to point out the danger of continuing actions before the state commissions or in the legislatures while the study of inductive interference is yet in an incomplete state. The Oklahoma action shows that this danger is being recognized, and it is with a great deal of pleasure that we record the fact, particularly as a similar attitude has been indicated in other cases that have not as yet reached so definite a conclusion. It is gratifying to note that the overhead situation has reached a point where the various interests can meet and avoid embarrassing controversies. It is due to the power and telephone interests and the public as well that the same sort of a basis for agreement be reached as promptly as possible in the inductive-interference situation. Electric light and power company men should appreciate the action taken in Oklahoma and not only do all they can to expedite this work but also give credit to the men representing both industries for the action they have taken in that state and appear likely to take in other states. It means progress.

Discriminating Influences that Accompany Municipal Ownership

IN THOSE days when a single community was served by five or six separate power installations and few, if any, power users were to be found in the surrounding agricultural districts the subject of power supply was one of simplicity. When one stops to consider, however, present transmission and distribution networks that not only serve entire cities and groups of cities but spread out into the country areas, and indeed on through several states, as they do in the South in Alabama, Georgia, east Tennessee and the Carolinas, or in the Pacific Coast areas in Oregon, California, Arizona and Nevada, the problem becomes far more complicated.

The ELECTRICAL WORLD has published no little information covering the trend in the West which leads thoughtful men to see that the inflexibility of power development under city control is likely to sound the death knell of such municipal activities unless means can be devised to overcome the problems of service caused by present-day demands for power. To this issue E. O. Edgerton contributes a convincing discussion of this timely subject. It will be recalled that Mr. Edgerton has proved himself a leader in many things connected with recent evolution in utility regulation. As president of the California Railroad Commission in former years, it was he who boldly came forth to champion the cause of a fair return on investments in spite of the fact that uneducated public opinion was at times violently opposed to advances in rates to meet increasing costs of production.

Mr. Edgerton in his article points out that the participation by a municipality or a number of municipalities in power development upon any particular stream or river, such as has lately been proposed in California—where municipal development is allowed to proceed independently of state regulatory bodies—would probably result in a definite allocation to each governmental entity, and that such allocation would at once result not only in confusion but in tying up power resources to such a degree that full service to power consumers, both within the city and within the rural communities beyond its boundaries where great areas are covered by interconnected power service, would be seriously jeopardized.

The power problem of the future in any state is not confined within city boundaries, and the demands of all customers must be equitably served as they present themselves, irrespective of their location. Without serious financial obstacles and expensive operating difficulties this is only possible through development and distribution by private capital. Under even partial municipal control of power developments large financial risks are invited, as well as discrimination in the division of power. In the former, and more particularly in the latter, contingency the rights of power users are protected when commission regulation has the fullest opportunity of expression. For under such expression flexibility, one of the outstanding demands of modern power service, is fully met and at the same time the rights of all taxpayers are fully safeguarded.

Intensity of Illumination and Visual Efficiency

THE paper by M. Luckiesh, A. H. Taylor and R. H. Sinden which is published in the current issue of the ELECTRICAL WORLD gives the results of some extremely interesting experiments upon the desirable intensities of illumination for the simple visual operation of reading. These experiments are striking in several respects. The fundamental observations were tests with reading matter of both strong and weak contrast, but always involving the idea of speed. It is already well known that rapid discrimination requires somewhat higher lighting intensities than deliberate observation, and the experiments recounted strongly emphasize this fact. Perhaps, indeed, they emphasize it a little too strongly, since the conditions involved the reading of moving type. This is, of course, not the condition found in practice, since the motion of the eyes in reading a moving page is entirely different from that which occurs in perusing an ordinary page at rest, however quickly. What effect this change of physiological condition had upon the results it is impossible to tell from the data presented. One would expect, however, that the difference involved with respect to the reactions on the ocular muscles would be very material, and *a priori* one would judge that the results would be just such as were obtained, that is to say, that the unfamiliar condition would require much stronger illumination than the familiar one for equal apparent ease of seeing.

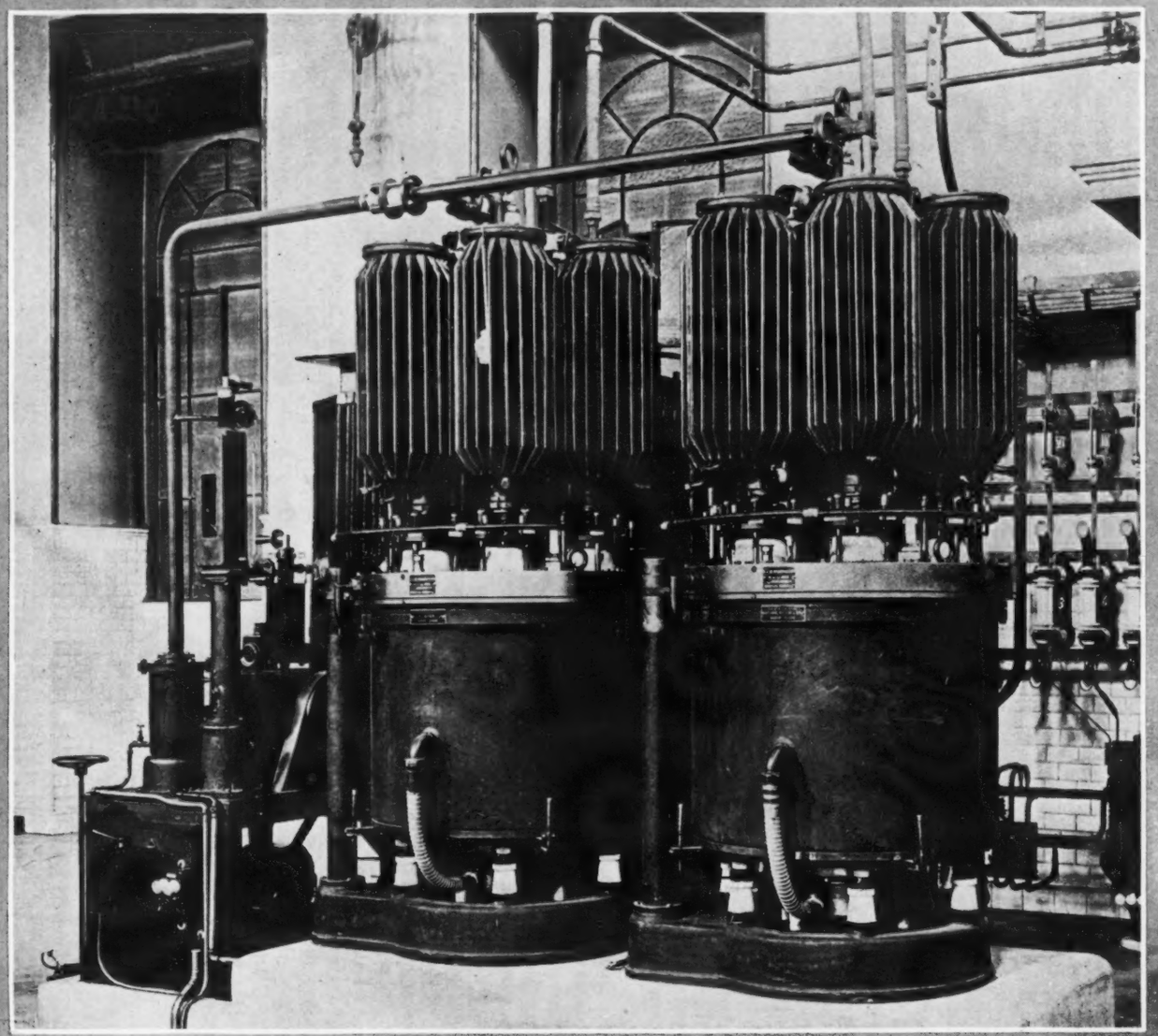
Of course, the tests were not carried out to the fatigue point as they have been in some experiments. Moreover, the intensities available were much greater than are usually found, so that the higher values would be unlikely, on account of irradiation, to be chosen by the observers. The actual facts showed that under the circumstances of the test the intensities of illumination selected were two or three times those common even in extremely well-illuminated reading rooms. It would be worth while to follow this phase of the matter into the domain of fatigue to discover whether in reading matter at rest, which is the normal condition of reading, these same intensities would or would not prove more wearying to the eyes than higher or lower ones.

Another striking series of experiments was carried out by comparing ordinary and monochromatic light, the gas-filled tungsten lamp being chosen for the former and the mercury arc for the latter. Here the tests were reading tests pure and simple and on stationary matter. They were not long continued, so that again the question of fatigue was eliminated, nor did they involve unusual muscular effort in following the type. The results showed that in general the observers selected a rather stronger light from the mercury arc, which is approximately monochromatic, than they did from the incandescent lamp, which covers a wide range of spectrum. This is the reverse of the well-known results obtained in testing for acuity under these two sources, and we are very strongly of the opinion that the experiments depended more on the psychological than on the actual visual factors. We are not inclined to deny that visual acuity is the determining factor for illumination for reading, and we fancy that the explanation of the curiously discordant results in this respect is the failure to take into account some of the very substantial psychological factors that appear when comparing two lights which obviously are radically different in spectral character, and, moreover, comparing them in succession rather than simultaneously. In some of the previous work on this subject a similar comparison has been made with test type in juxtaposition illuminated simultaneously from the two different illuminants, and in this case the monochromatic light was found to have large advantage in the matter of acuity. One cannot analyze without investigation of the exact circumstances of the test the difference between the two results, but it is sufficiently great to demand a further threshing over of the whole question, which is one of large practical importance in the matter of determining the character and intensity of illuminants. The psychology of illumination is a field as yet altogether too little investigated.

Electric Truck Operation Will Withstand Economic Comparisons

IF ANY ONE who has any doubt in his mind regarding the economy of electric street trucks will take the trouble to interview users of such vehicles, he will usually find that the trucks are fully justified on economic grounds. The only regret is that data on the experiences of various electric truck users have not been made more readily available, for then much of the illusion regarding the limitations of the electric vehicle would be dispelled. The case we describe this week is a thoroughly typical one, including the operation of 149 trucks in the service of a single company in the simple task of delivering bread from the bakery to the retailer. The region covered is Greater New York and its vicinity. The delivery cost in the bakery business seems to be an important item, and in the instance we describe the electric truck has thoroughly justified its employment after experience both with horses and with gasoline trucks. One of the most interesting features of this varied experience was the relation found to exist between the most economical type of haulage and the distance to be covered. For trips between 15 miles and 45 miles in length, in the course of the regular deliveries, electric trucks proved the most economical. For very short delivery trips, under 15 miles, horses held their own, and for long runs, more than 45 miles, the gasoline trucks had enough advantage in speed to push themselves to the front.

The average run of the electric trucks is about 35 miles a day, in the course of which about fifty deliveries are made. The experience of several years has shown that the depreciation can be distributed over a decade. Repairs and maintenance average $25 a month and battery charging $22 a month, the company doing this work itself. The depreciation on the batteries is on a five-year basis. These figures apply to those of the trucks which are of the 1-ton variety. The ½-ton trucks cover a little less ground and cost a little less for maintenance and a good deal less for charging. The average speed is about 14 miles an hour, to which figure the trucks are geared. This relatively low speed is believed to be advantageous and is certainly productive of fewer accidents than occur with the gasoline trucks. A very interesting feature of the situation is that the "electrics" have more advantage over the gasoline trucks than over horse-drawn vehicles, although they are superior in economy to both. Any one who has seen the ordinary gasoline truck on the wild joy ride of its return journey will divine the reason for himself.



Large Power Rectifier Merits Consideration in This Country

WITH a record of 100,000 kw. installed capacity in Europe, the large power rectifier has reached a point in development where it merits consideration in American practice. Nearly every one is familiar with the glass-bulb type of mercury-arc rectifier which has established itself rather firmly in this country for charging batteries, operating arc lamps, etc., but its big brother—the large power rectifier—has not become commercially known on this side of the water, with few exceptions, although some large manufacturers have been known to experiment with its development. The steel-clad rectifiers shown here are installed in a railway substation in Milan, Italy, and are rated at 500 kw., 550 volts direct-current. Brown, Boveri & Company of Baden, Switzerland, have developed the European rectifiers to their present state of perfection, making them for 300, 600 and 900 amp. and any voltage up to 800 and in 300-amp. size for 1,200 volts.

Inflexibility of Power Development by Municipalities

Limitations Surrounding Municipal and Government Operation of Electric Utilities, with Especial Reference to Development of Large Power Sites Where Demands for Service Come from Customers in Several States

By EDWIN O. EDGERTON
President East Bay Water Company and Formerly President California Railroad Commission

DISCUSSION of the merits of municipal development and distribution of hydro-electric energy as contrasted with development and distribution by privately owned public utility companies under state regulation is bringing out many aspects of the problem not heretofore adequately considered. One of these aspects which is of importance is the relation of consumers of electricity to the electric supply. It may be laid down as a premise that electric service will not be completely satisfactory unless there be at all times readily available to each consumer service in such amount and of such character as to fit his particular needs. Rates, of course, are important but are not finally controlling. It is idle to enlarge upon the benefits of low electric rates if the service is not available. Much confusion has occurred from the loose use of words such as "municipal ownership," "public ownership" and "government ownership."

LIMITATIONS SURROUNDING MUNICIPAL AND GOVERNMENT OPERATION

Municipal ownership and operation of a utility service is confined to a separate distinct group of people organized as a city, or possibly as a municipal corporation such as an irrigation district, and the operation of a public utility service by such a group for the sole use and benefit of the people constituting this group, with no regard to outside communities or individuals.

Government ownership, on the other hand, implies the idea of a governmental unit sufficiently large to embrace all of the people, such as a state or the nation. Particularly must this distinction be made because of the modern status of electric service where, as in so many instances, the service has outgrown the boundary of any city or group of cities and has spread over great portions of the state, so that any adequate consideration of public ownership must include operation by the state itself. For instance, it would not seriously be considered that even the largest city in California—Los Angeles—could take over and operate the public utility electric company which operates throughout southern California and whose service is only 10 per cent within the boundaries of that city. Neither could the county of Los Angeles successfully operate this business because a large amount of service is given in other counties. Therefore the only governmental unit sufficiently comprehensive would be the state.

There are certain aspects of the electric power situation which involve service from given points of generation throughout as many as seven states, and here is an operation which of necessity must be performed, if to be done publicly, by the national government. Short of the complete governmental development and distribution of electric power without discrimination as between consumers, and which must at all times be ready and able to produce service to any and all consumers when and as needed, there is no form of governmental interposition in the power business which could possibly give satisfactory service.

HYDRO-ELECTRIC DEVELOPMENT BY MUNICIPALITIES CANNOT PROVIDE FOR SERVICE OUTSIDE

A municipality in seeking to develop electric power from sources outside of its boundaries must of necessity act selfishly. The only method of financing such development is through the issuance of municipal bonds. Naturally citizens who are called upon to vote such bonds require the assurance that a specified minimum amount of power will become available for the sole use of the city or its citizens to the exclusion of all other consumers, and it cannot be maintained that a city having an opportunity to seize and hold power rights on mountain streams will take only so much as will result in its receiving a fair proportion of power to be developed considering all other municipalities which may thereafter desire to make like developments. The fact is that a city acts for its own interests and seeks to secure for itself power sufficient not only for its present needs but for such needs as may be expected in the future, and it does this without any consideration whatever for other municipalities or other consumers.

Furthermore, the participation by a municipality or a number of municipalities in the development of a given stream would undoubtedly result in a definite allocation to each governmental entity; and once fixed this allocation would be inflexible, there being no governmental agency to make any adjustment based on the needs of all power consumers. Once a city obtained rights and developed power on a stream, there could be no hope thereafter of a division of such power between such city and other consumers, no matter how great the needs of such other consumers might be.

The only way in which hydro-electric energy could be developed by municipalities in fairness to all present and prospective consumers would be for the cities to develop power which would be available at all times for distribution to consumers both inside and outside of city boundaries; but this, as has been shown, is a virtual impossibility. No city or group of cities would invest municipal funds in a power enterprise and risk the possibility and probability of having to share the power developed with any consumer present or prospective who might thereafter need service.

If a city did this, it might and probably would find itself in a position after investing municipal funds

where its power supply would be seriously cut in order that consumers outside of the city should be given service, with the result that the city's enterprise would be unremunerative unless the city went into the general power business and sold power to the outside consumers, and this, as has been suggested, is an impossible conception of a municipal enterprise.

PUBLIC UTILITY COMPANY CAN FURNISH SERVICE WHEREVER NEEDED

Contrasted with this situation, the public utility under regulation provides complete elasticity and is an agency from which, without discrimination, all consumers may receive service when and as needed, no matter where they are located, provided, of course, that they are within a practicable distribution area. A public utility company must at all times be ready to give service not only to old consumers but to new consumers who desire to be attached to the system. Regulation does not permit favoring any one locality over another in the matter of service, and the development of electric power by a public utility company cannot be made for any given locality but must be made for the benefit of all consumers within a reasonable distribution area.

The truth of what has been said becomes apparent when we consider the proposed development of electric power on the Colorado River, and here the conditions incident to municipal development as outlined would apply equally to state development. On the Colorado River there is a possibility of developing energy to be distributed in at least seven states, and it may fairly be said that the development of this energy should be made with a comprehensive consideration of the needs of the consumers in all of these states. No one city, no group of cities and no one state has a right to claim all of this electrical energy as it must be distributed fairly throughout the Southwest.

DEVELOPMENT OF COLORADO RIVER BY PRIVATE CAPITAL AN EXAMPLE OF EQUITABLE SERVICE

For any city or group of cities or for any state to obtain rigid and perpetual rights to definite amounts of power on the Colorado River would create the inflexible condition which has been shown as impossible if service is to be given to all consumers. In the first place, there is no reasonable basis upon which a definite allotment could be made to each governmental unit, and if an allotment were made either upon an arbitrary basis or on a basis of population or on a basis of present consumption, this allotment would definitely restrict development as to those great areas which will undoubtedly be developed but which would have received no allotment because of their present unorganized condition. Furthermore, such an allotment must of necessity contemplate future needs as well as present ones, and if made on that basis, it would as to some areas now sparsely settled hold out of use electrical energy for a long period of time at great economic loss.

Moreover, most of the governmental units which might seek an allotment at the time of the division of power rights on the Colorado River are wholly unprepared to develop and use such power and have no present thought of going into the power business.

On the other hand, the public utility company under regulation affords a remarkably adequate agency for the logical development of power and the distribution of energy fairly and equitably among the consumers as they present themselves, wherever they may be located. There need be no definite allotment of power to any given community, because the power company would develop power in logical steps, keeping somewhat in advance of demand but seeking always to prevent a heavy investment for power development which for a long period would remain idle because of a lack of demand. Under this scheme the public, with no financial risk except as it might invest in the securities of the company, would obtain electrical energy at times and in quantities to suit the needs of consumers, and all of the citizens of all of the states would be assured of non-discriminatory treatment and a division of the power fairly and equitably made under governmental regulation and free from the rigid, inflexible dedication of definite amounts of power to any given community or state.

Operating Expenses Decrease 16 per Cent

Gross Revenue of Electric Light and Power Companies Increases, While Operating and Maintenance Expenses Decrease

REPORTS received by the ELECTRICAL WORLD for the month of July from central generating and distributing companies representing 78 per cent of the installed rating of the country indicate that the average electrical energy requirements of the country were the lowest since September, 1919. However, a comparison with the war-time energy output of the central generating stations shows that the output during July was still higher than that reported during the war period. The average gross revenue for July was the lowest since August of last year, but was still more than 15 per cent greater than that reported for any month during the war.

Also, in spite of the fact that with but few excep-

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE MONTHS

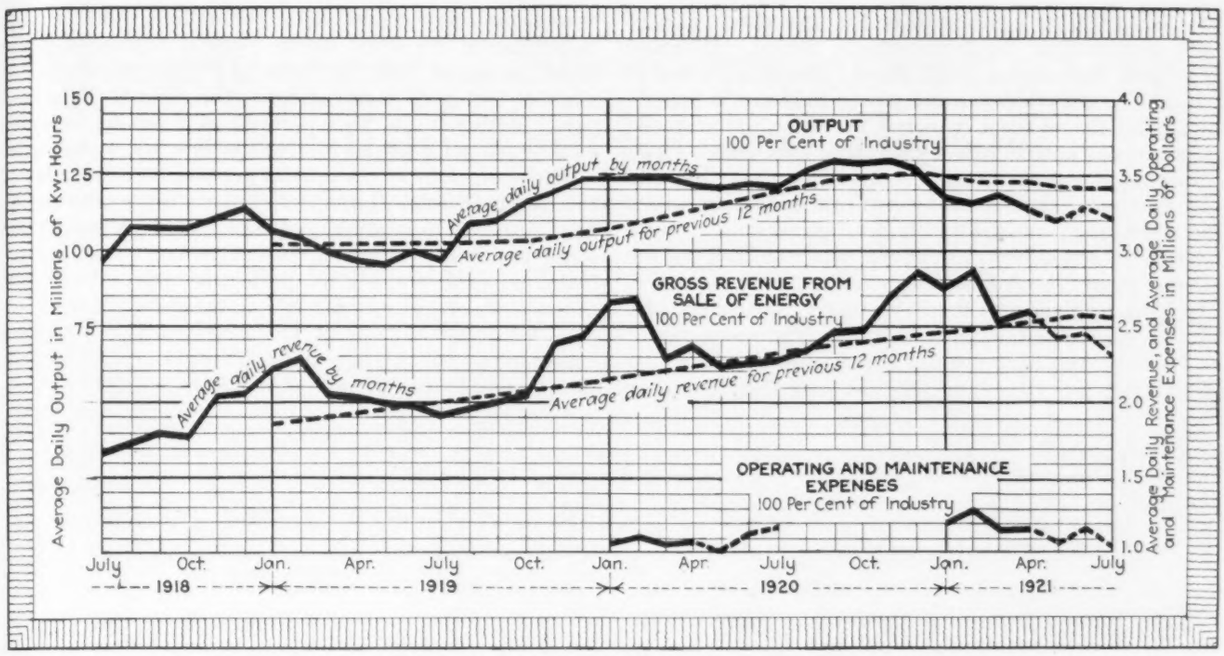
	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1920 Thousands	1919 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1920 Thousands	1919 Thousands	Per Cent Increase
Aug.	71	2,769,175	2,303,099	20.1	66	$47,410	$36,713	29.1
Sept.	71	2,734,179	2,327,460	17.4	66	49,224	38,209	28.5
Oct.	71	2,797,625	2,499,488	11.9	66	51,370	41,055	25.1
Nov.	71	2,741,705	2,503,402	9.6	66	54,620	44,711	22.0
Dec.	71	2,792,554	2,648,746	5.4	66	57,697	48,580	18.6
		1921	1920			1921	1920	
Jan.	76	2,765,632	2,943,349	−6.0	70	58,855	50,861	15.8
Feb.	76	2,453,671	2,711,800	−9.4	70	55,540	48,633	14.3
Mar.	77	2,806,609	2,989,581	−6.1	72	55,513	49,071	13.3
April	78	2,675,949	2,895,067	−7.0	72	55,326	49,064	12.8
May	78*	2,668,457	2,889,174	−7.6	72	53,901	47,932	12.6
June	78†	2,675,589	2,883,569	−7.2	72	52,548	47,891	9.8
July	78‡	2,681,844	2,916,678	−8.1	72	51,362	48,957	4.8

	Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies reporting) 1921 Thousands of Dollars	1920 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1921	Steam Plants 1920	Hydro Plants 1921	Hydro Plants 1920	Combined Systems of Steam and Hydro 1921	Combined Systems of Steam and Hydro 1920
Jan.	40	14,562	13,085	11.3	56.1	55.3	26.8	27.0	38.1	45.6
Feb.	43	15,085	13,640	10.5	55.6	54.5	22.9	26.0	44.1	47.3
Mar.	53	18,757	17,248	8.7	56.1	57.7	23.4	19.6	40.2	44.8
April	53	17,815	16,641	7.1	53.0	56.5	23.9	19.8	41.4	43.3
May	53	17,274	16,727	3.1	55.4	56.8	24.2	22.9	40.6	44.8
June	54	18,646	18,758	−0.5	56.2	62.5	20.4	21.6	15.0	50.9
July	54	17,779	19,874	−10.5	56.8	65.9	20.6	20.2	43.0	52.6

*Includes estimates for forty-nine companies, representing 9.7 per cent of the total installed rating of all central stations.

†Includes estimates for seventy-eight companies, representing 16.3 per cent of the total installed rating of all central stations.

‡Includes estimates for one hundred and seventeen companies, representing 20.9 per cent of the total installed rating of all central stations.



CENTRAL-STATION GROSS REVENUE, OPERATING EXPENSES AND OUTPUT DECREASE DURING JULY

tions virtually all the primary industries of the nation were operating at only a small percentage of their capacity and were reporting correspondingly decreased financial returns, the electric light and power industry, while selling 8 per cent less electrical energy in July of this year than in July of 1920, reported gross revenue 4.8 per cent in excess of that received in July of last year. In addition, the operating and maintenance expenses during July were 16 per cent below those of July, 1920. Expressing these figures in terms of the operating ratio, or ratio between operating expenses and gross revenue, gives further evidence of the tendency toward financial prosperity in the electric light and power industry. During July of the present year the operating ratio of all companies taken in the aggregate was 46.1 per cent, as against 54.1 per cent reported

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	New England States				Atlantic States				North Central States				South Central States				Pacific and Mountain States			
		Percentage of Installed Ratings Represented	1920 Thousands	1919 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	1920 Thousands	1919 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	1920 Thousands	1919 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	1920 Thousands	1919 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	1920 Thousands	1919 Thousands	Per Cent Increase
KW.-HR. OUTPUT	Aug.	82	194,028	171,002	13 5	66	905,170	728,097	24 2	74	891,712	750,787	18 6	56	147,082	111,573	32 0	79	631,183	541,640	16 5
	Sept.	82	194,730	170,593	14 1	66	905,872	758,737	19 5	74	878,237	758,017	15 9	56	147,524	113,649	30 0	79	607,816	526,464	15 5
	Oct.	82	196,310	191,132	2 7	66	964,739	841,694	14 5	74	896,241	817,757	9 5	56	157,267	126,769	24 1	79	583,068	522,136	11 7
	Nov.	82	193,231	183,624	5 4	66	953,436	825,011	15 5	74	895,229	861,352	10 5	56	144,889	125,438	15 0	79	554,920	507,977	9 2
	Dec.	82	210,494	227,403	-7 4	66	969,909	917,945	5 7	74	903,628	852,264	5 9	56	140,485	133,419	5 3	79	568,038	517,715	9 6
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	81	200,269	247,800	-19 2	77	1,003,223	1,043,650	-3 9	73	860,643	956,078	-10 0	62	144,936	145,336	-0 3	81	556,561	550,685	1 1
	Feb.	81	178,694	216,890	-17 6	77	902,030	970,539	-7 0	73	789,539	882,873	-10 6	63	131,654	132,537	-0 7	81	451,754	508,961	-11 2
	Mar.	81	205,348	230,309	-10 8	79	1,029,120	1,119,428	-8 1	73	894,500	941,893	-5 0	63	139,381	136,017	2 4	81	538,260	561,934	-4 2
	April	81	196,680	227,008	-13 3	79	963,659	1,052,716	-8 4	73	828,457	894,028	-7 3	63	132,075	135,421	-2 5	88	555,048	586,894	-5 4
	May	82	191,141	219,298	-12 8	79	934,973	989,408	-5 5	73	819,506	899,657	-8 9	63	136,573	138,416	-1 3	89	586,264	642,495	-8 7
	June	82	191,550	218 646	-12 3	79	941,058	1,003,870	-6 2	73	801,705	891,253	-10 0	63	136,548	130,015	5 0	89	604,108	639,779	-5 5
	July	81	188,238	219,159	-14 1	79	937,900	1,017,530	-7 8	73	792,992	879,743	-9 9	64	138,013	138,946	-6 7	89	625,701	662,300	-5 4
REVENUE			1920	1919			1920	1919			1920	1919			1920	1919			1920	1919	
	Aug.	82	$5,075	$4,093	24 0	65	$17,210	$13,731	25 9	57	$13,497	$10,151	32 9	54	$3,168	$2,281	38 1	79	$8,460	$6,457	31 1
	Sept.	82	5,409	4 296	25 9	65	18,081	14,456	24 5	57	13,834	10,522	31 5	54	3,262	2,386	36 5	79	8,638	6,549	32 0
	Oct.	82	5,675	4,623	22 7	65	19,201	15,722	22 0	57	14,458	11,667	23 9	54	3,504	2,551	37 3	79	8,532	6,492	31 5
	Nov.	82	5,898	5,017	17 5	65	20,938	17,119	22 2	57	15,158	12,561	20 8	54	3,853	2,910	32 4	79	8,775	7,104	23 5
	Dec.	82	6,548	5,744	14 0	65	22,332	19,149	16 7	57	16,004	13,142	21 8	54	3,722	3,113	19 8	79	9,091	7,432	22 3
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	81	6,379	6,170	3 5	74	22,180	19,225	15 3	59	16,818	14,436	17 3	62	4,155	3,484	19 3	81	9,323	7,546	23 6
	Feb.	81	5,925	5,728	3 4	74	21,492	18,327	17 4	59	15,971	14,070	13 6	62	3,915	3,329	17 6	81	8,237	7,179	14 7
	Mar.	81	5,784	5,566	3 8	76	21,822	18,934	15 3	59	15,853	14,103	12 4	63	3,747	3,246	15 5	81	8,307	7,222	15 0
	April	81	5,665	5,554	2 0	76	21,504	18,609	15 8	60	15,506	13,822	12 2	63	3,744	3,312	13 2	88	8,817	7,767	13 6
	May	82	5,362	5,342	0 4	76	20,795	17,613	18 0	60	14,866	13,558	9 8	63	3,516	3,179	10 7	89	9,362	8,240	13 7
	June	82	5,255	5,366	-2 0	76	20,091	17,442	15 3	60	14,514	13,486	7 7	63	3,531	3,164	11 6	89	9,157	8,433	8 5
	July	81	5,189	5,135	1 0	76	19,149	17,107	11 9	60	14,269	14,677	-2 7	63	3,505	3,129	12 1	89	9,250	8,909	3 8
OPERATING EXPENSES:																					
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	34	$1,098	$1,288	-14.7	48	$6,373	$5,411	17 8	28	$3,941	$3,451	14 2	37	$1,015	$905	12 2	54	$2,135	$2,030	5 2
	Feb.	35	1,069	1,242	-13.9	53	6,799	5,937	14 5	29	3,958	3,445	14 8	44	1,217	1,053	15 5	55	2,042	1,963	3 9
	Mar.	45	1,576	1,651	-4 5	59	7,969	7,241	10 0	35	4,570	4,228	8 2	51	1,776	1,514	17 2	79	2,866	2,614	9 7
	April	45	1,418	1,479	-4 1	59	7,590	7,168	5 9	36	4,347	4,112	5 7	51	1,567	1,403	11 6	79	2,893	2,479	16 8
	May	48	1,548	1,577	-1 8	56	6,921	6,660	4 0	37	4,274	4,292	-0 4	52	1,563	1,486	5 2	81	2,969	2,713	9 5
	June	46	1,714	1,826	-6 1	56	6,898	6,810	2 9	39	4,276	5,116	-6 6	60	1,859	1,665	11 6	83	3,459	3,341	3 5
	July	47	1,698	2 022	-16.0	53	6,196	6,566	-5 6	39	4,776	5,651	-15 5	62	1,862	1,921	-3 1	83	3,247	3,714	-12 6

for July, 1920, or a decrease in the operating ratio of 8 per cent during the twelve-month period. It would seem from these figures that, from a financial viewpoint at least, the electric light and power industry is experiencing the almost ideal economic condition of increased gross revenue and decreased operating expenses.

Reports of industrial conditions during July indicate that further curtailments were continuing in every manufacturing industry with few exceptions. Materially increased activity, however, was reported by the railroad repair shops from every section of the country.

In New England the textile industry reported a continued high percentage of activities, certain sections of the industry reaching normal and frequently exceeding it. Otherwise the industrial energy requirements operations were reported by the milling and packing industries of the West North Central States. Despite these increased industrial energy requirements and a slightly increased lighting load, the electric light and power companies of this section, as a whole, reported an average daily output of 1,600,000 kw.-hr. under June.

The operations of the central generating companies of the South Central States reflected the increased industrial depression existing in that section. Many of the large factories were entirely cut down, while the remainder were working on part time only. Very few mines were operating over two or three days a week.

The mining and allied industries of the Mountain States reported no improvement over June, with additional curtailments in several localities. Industrial con-

TABLE III—AGGREGATE OPERATING RATIO OF COMPANIES REPORTING DATA MONTHLY TO THE "ELECTRICAL WORLD"

Type of Generating Plant and Month	New England States				Atlantic States				North Central States				South Central States				Mountain and Pacific States			
			Average for Year				Average for Year				Average for Year				Average for Year				Average for Year	
	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920
Steam Plants:																				
January	54.0	60.8	54.0	60.8	53.5	50.9	53.5	50.9	61.2	61.8	61.2	61.8	53.1	53.7	53.1	53.7	69.0	60.5	69.0	60.5
February	54.3	59.5	54.2	60.3	52.3	53.0	52.7	52.1	63.0	57.9	62.1	59.8	59.1	51.2	56.2	52.3	60.2	60.3	64.3	60.3
March	64.0	70.0	56.7	62.5	54.5	56.7	53.3	53.7	58.4	59.7	60.8	59.8	53.3	50.9	55.0	51.9	68.4	62.5	65.9	61.2
April	59.4	63.5	57.3	62.7	50.9	54.3	52.8	53.8	54.8	61.2	59.3	60.2	54.1	52.8	54.7	52.1	53.7	53.7	61.8	58.6
May	63.2	69.1	58.3	63.8	56.2	58.6	53.4	54.5	54.7	63.3	58.5	60.8	53.3	56.0	54.4	53.0	55.0	57.0	59.9	58.3
June	60.1	71.2	58.7	64.9	55.8	59.5	53.8	55.3	56.6	68.3	58.3	61.8	55.3	60.0	54.6	53.8	53.4	56.2	58.6	57.8
July	60.7	77.3	59.0	66.7	57.2	62.7	54.1	56.1	56.9	70.6	58.1	63.0	55.1	62.4	54.7	55.3	53.3	59.3	57.8	58.0
Hydro Plants.																				
January	26.5	35.2	26.5	35.2	21.2	21.2	21.2	21.2	25.0	20.8	25.0	20.8	26.4	20.1	26.4	20.1	27.5	27.3	27.5	27.3
February	30.1	46.5	26.8	35.6	20.1	20.6	20.7	20.9	24.1	20.6	24.6	20.6	28.6	21.4	27.4	20.5	23.9	27.9	26.0	27.6
March	29.9	30.0	26.9	35.3	21.0	20.6	20.8	20.8	23.0	20.6	23.5	20.6	30.4	23.2	28.4	21.3	24.9	19.0	25.8	25.6
April	24.6	34.7	26.5	35.2	18.2	18.8	20.2	20.3	24.8	20.8	24.2	20.7	22.4	25.0	26.8	21.2	27.3	19.2	26.0	24.2
May	26.5	25.6	26.5	34.3	15.5	17.4	19.2	19.7	21.5	20.1	22.5	20.5	27.9	21.2	27.1	21.2	29.8	22.9	26.6	24.0
June	29.2	21.5	26.6	33.8	17.6	18.8	19.0	19.6	21.1	19.5	22.8	20.2	27.3	18.3	27.1	20.7	30.3	27.4	27.6	24.2
July	29.2	29.6	26.6	33.9	15.9	21.1	18.6	19.8	19.4	19.7	22.3	20.2	27.3	18.3	27.7	20.7	24.2	19.9	26.3	23.7
Combined Systems of Steam and Hydro Plants:																				
January	45.3	53.5	45.3	53.5	43.5	45.8	43.5	45.8	39.5	38.6	39.5	38.6	38.6	46.6	38.6	46.6	35.2	45.6	35.2	45.5
February	44.3	60.0	44.7	58.8	41.8	41.9	42.6	43.8	42.4	49.8	41.9	48.2	41.7	39.6	40.5	42.0	39.6	43.8	37.4	44.7
March	49.7	53.8	47.3	56.0	39.7	47.3	42.0	45.3	41.5	46.0	41.8	47.3	38.6	39.2	40.2	41.2	36.4	39.7	36.9	43.0
April	46.6	48.5	47.1	53.5	42.9	43.9	41.9	44.8	45.0	48.3	42.7	47.5	43.6	48.6	40.7	42.8	37.0	36.8	37.0	41.7
May	49.2	48.5	47.6	52.3	39.8	44.2	41.4	44.7	47.0	52.8	43.7	48.8	40.7	39.6	40.6	42.2	35.0	38.3	36.4	40.3
June	58.5	56.5	49.6	53.2	42.3	45.8	41.6	44.9	50.1	62.2	45.0	51.6	45.1	44.8	41.3	42.7	38.8	44.3	37.0	41.1
July	56.1	63.2	50.5	54.7	42.6	51.3	41.7	45.8	51.6	64.4	46.0	53.9	53.6	45.3	41.4	42.8	35.4	43.1	36.8	41.5

throughout this section were about the same as during June. The extent of the general industrial depression in the New England section, however, is apparent from the fact that the electrical energy consumed in this section during July was more than 14 per cent below the energy requirements of July, 1920. Despite this large drop in output during the twelve-month period, the gross revenue of the electric light and power companies of this section increased by 1 per cent and the operating expenses decreased by 16 per cent during the period.

The stone, clay and glass industries of the Middle Atlantic States reported curtailment under June operations of from 22 to 53 per cent, and the iron and steel operations in this section were further curtailed by more than 7 per cent. In contrast to these decreases in electrical energy requirements was a material increase in the operations of the railroad repair shops in this portion of the Atlantic section. In the South Atlantic States textile operations were about the same as during June, the only material increased activity being that reported by the railroad repair shops. Taking the Atlantic States as a whole, the decreased industrial energy requirements resulted in an average electrical output of 1,400,000 kw.-hr. below that reported in June, in spite of a gradually increasing lighting load.

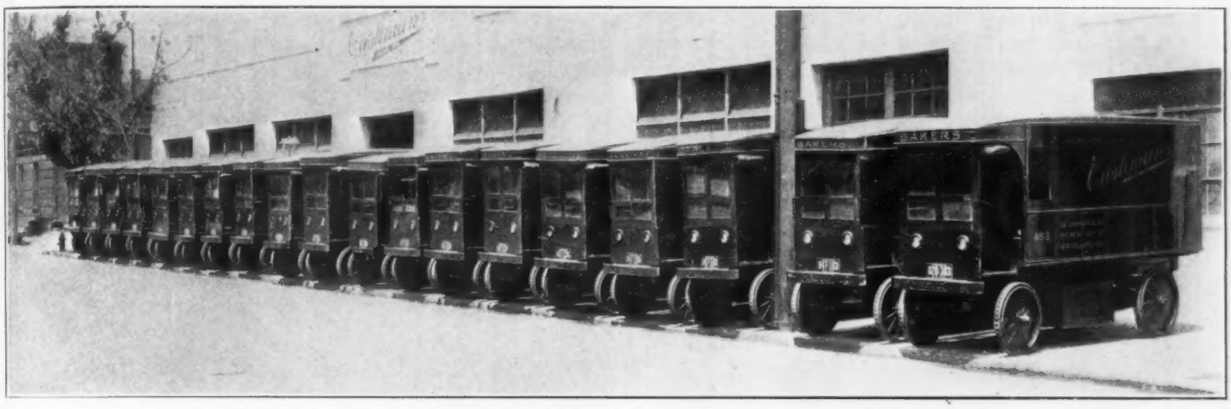
Stagnation continued in most of the essential industries of the North Central States. Railroad repair shops in the East North Central States, however, reported materially increased operations, and increased ditions in the Pacific States averaged about the same as during June, some industries decreasing operations slightly and others showing a slow recovery. Taking the Mountain and Pacific States as a whole, the electrical energy requirements were approximately the same as during the month of June.

Switzerland Wants Better Prices for Exported Energy

ACCORDING to a cablegram to the New York *Times*, Switzerland has discovered that she exports to Germany and France, but chiefly to Germany, electric power which saves those countries 450,000 tons of coal annually, worth 18,000,000 gold francs, whereas the sales bring Switzerland only 5,000,000 gold francs annually. In 1920 about 350,000,000 kw.-hr. was, the dispatch says, exported by Switzerland to neighboring countries. The production of 1 kw.-hr. of electricity requires fully 1 kg. of coal, which costs in Germany 40 pfennigs. Now, on the average, the Swiss have been selling electricity to the Germans and French at 2 centimes or less per kilowatt-hour, whereas the price of electricity on the world's market is from 6 to 8 centimes per kilowatt-hour. In some parts of Switzerland factories must pay for electric power 45 centimes per kilowatt-hour; but German manufacturers, who are mostly competing seriously with Swiss industry, contrive to get it thirty times cheaper than the Swiss themselves.

Electric Trucks Show Superiority Over Gasoline Trucks and Horses

They Have Proved Themselves Cheaper, Cleaner and Easier to Operate on 15-Mile to 45-Mile Delivery Trips—One-Ton Truck Costs 32 Cents per Mile, Including All Fixed and Operating Charges—Repairs Are Made More Quickly



PART OF A FLEET OF ½-TON ELECTRIC TRUCKS WHICH HAS PROVED SUPERIOR TO HORSES AND GASOLINE TRUCKS IN MAKING DELIVERIES

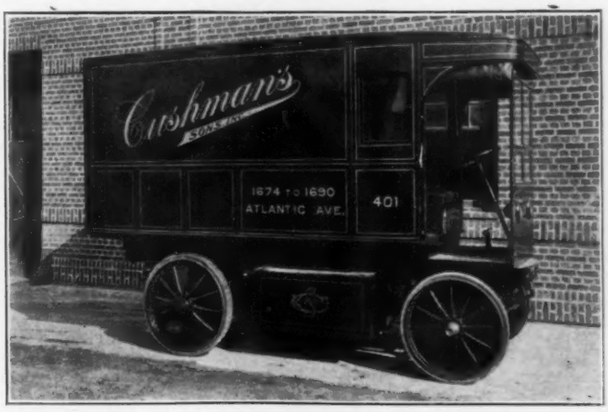
ELECTRIC street trucks in their wide field of application have proved their superiority over all other means of transportation. A case which well illustrates this superiority is that of Cushman's Sons, Inc., bakery, New York City. This company has found by careful studies that for deliveries requiring round trips of 15 miles to 45 miles (24 km. to 72 km.) the electric truck is cheaper, cleaner and more easily taken care of than any other type of conveyance. This conclusion was reached after six years' experience with electric trucks, gasoline-engine trucks and horse-drawn vehicles.

The company operates an electric fleet of 149 trucks, of which 105 are 1-ton trucks, forty are ½-ton trucks and four are 5-ton trucks. Twenty more 1-ton trucks are on order. All the electric trucks are of the same make, Walker. The 1-ton and ½-ton sizes are equipped with large, high-grade, closed bodies, designed for carrying loaves of bread. The 5-ton size is equipped for hauling flour to bakeries. Deliveries are made seven days a week to grocers all over Greater New York and vicinity. Six of the 1-ton machines average 40 miles (64 km.) a day each.

In the baking business the margin of profit is small and the delivery cost is an important item. For this reason an especially careful study of the transportation end of the business was made with the object of reducing the delivery cost to a minimum. Undoubtedly the most important single factor in effecting this reduction is the choice of the proper vehicle. Experience proved that horses, electric trucks and gas trucks all have a place in this company's system.

It was determined that for round trips up to about 15 miles horses are best; for round trips between 15 miles and 45 miles, electrics, and for round trips over 45 miles, gas trucks. The "electrics" average between 20 miles and 40 miles (32 km. and 64 km.) a day, depending on the nature of the routes. The accompanying table shows actual costs on typical ½-ton and 1-ton trucks, both of which are equipped with Edison

FIVE-TON ELECTRIC TRUCKS ARE MOST ECONOMICAL MEANS FOR HAULING HEAVIER LOADS



THIS 1-TON ELECTRIC TRUCK AVERAGES 35 MILES PER DAY, MAKING FIFTY STOPS, AT TOTAL COST OF $11.26

Form 19 NATIONAL STANDARD TRUCK COST SYSTEM. TRUCK OWNERS CONFERENCE, INC., 5 S. WABASH AVE., CHICAGO

CHECK SOURCES OF DATA
☐ National Standard System
☒ Individual System
☐ Owner's Records
☐ Owner's Estimates
☐ Investigator's Estimates

No. 4-BEM-3

ANALYSIS OF TRUCK COST

According to National Standard Cost Practice of the Truck Owners Conference
H. P. GOULD, Chairman

Date 7-8-21-X

Owner Cushmans Sons, Inc., Age of Truck at Start of Period

Address 49 Manhattan St., New York City Period Covered 1 year to 6-27-21

Operation Delivery of bread to Grocers

Truck Capacity 1-ton Make Walker Model Mfgrs. No. Truck No.

Analysis of Operation

A. Number of Days Operated	351	C. Delivery or Pick-up Stops	17,550	E. Total Units	0 In
B. Number of Round Trips	526	D. Total Units	7,890 CWT Out	F. Miles Traveled	12,285

3A. Investments:		3B. Fixed Expense:	Year Estimated	Mtc. and Repair—Actual as Guide to (35)
(1) Chassis		(11)*Interest, Item (8) 10 Yrs. @ 7 %	154 00	(20)
(2) Storage Battery (if Electric)		(12) Taxes (Property)		(21)
(3) Body		(13) License (State, City, etc.)	25 00	(22)
(4) Top		(14) Administrative Overhead		(23)
(5) Painting		(15) Garage (Rent, Light, Heat, Power)	300 00	(24)
(6) Freight		(16) Insurance	168 00	(25)
(7) Special Equipment				(26)
				(27)
(8) Total	4000 00	(17) Total Fixed Expense per Year	647 00	(28)
(9) Subtract Tire Value	160 90	(17a) Total Prorated for Period	647 00	(29)
(2) Subtract Storage Battery Value	1593 00	(18) Total Fixed Expense per Month (17÷12) (17a÷A)	53 91	(30)
(10) Total (Less Tires and Batteries) to be Depreciated	2246 10	(19) Total Fixed Expense per Day	1 8453	(31)
Present Book Value		*Interest Formula: $\frac{A+1}{A} \times \frac{C \times B}{2}$ In which (A) equals length of working fund period in years. (B) equals the investment. (C) equals the rate of interest.	Period	(32) Total For (32a) Per Mile

Depreciation Total Cost (10) $ 2246.10 For Minimum Life of (33) 122,850 Miles = (34) $ .0183 Per Mile

Maintenance and Repair: Estimated for Period (35) $ 300.00 For (F) 12,285 Miles = (36) $ .0244 Per Mile

Repair Due to Accident: (Not Covered by Insurance): (37) $ For (F) Miles = (38) $ Per Mile

Tire Cost: (9) $ 160.90 For Life of (39) 10,000 Miles By Actual Experience = (40) $ .0161 Per Mile

Fuel Cost: (41) 5600 KWH KW (42) @ 4 ¢ per KWH = (43) $ 264.00 For (F) 12,285 Miles = (44) $ .0215 Per Mile

Cylinder Oil Cost: (45) none Gals. (46) @ ¢ per Gal. = (47) $ For (F) Miles = (48) $ Per Mile

Battery Renewals and Maintenance: (49) $ 316.60 For (F) 12,285 Miles = (50) $ .0259 Per Mile

Total Variable Expense: For Period (51) $ 1304.67 (Excluding Driver's Wages) For (F) 12,285 Miles = (52) $ .1062 Per Mile

Total Fixed Expense: For Period (17a) $ 647.00 For (F) 12,285 Miles = (53) $ .0527 Per Mile

Total Driver's Wages: For Period (54) $ 2000.00 (@ (55) $ 5.70 per Day) For (F) 12,285 Miles = (56) $ .1628 Per Mile

Total Cost: For Period (57) $ 3951.67 For (F) 12,285 Miles = (58) $ .3217 Per Mile

Cost per Day, Variable Expense: (52) $ .1062 per Mile × Average Miles per Day (59) 35 = (60) $ 3.7170 Per Day

Fixed Expense: = (19) $ 1.8453 Per Day

Driver's Wages: = (55) $ 5.6980 Per Day

Total Cost per Day: = (61) $ 11.2603 Per Day

NOTE.—To figure the cost on other mileage per day than the average for the period, Item (59), it is only necessary to multiply Item (59) by the number of miles desired, and add Items (19) and (55) which remain the same. Unless operating conditions should be the same, otherwise items (52) will vary.

Cost per Unit: Total Cost for Period (57) $ 3951.67 ÷ Total Units Hauled (D+E) 7890 = (62) $ .5008 per (Unit) CWT

(Unit) CWT Miles for Period (63) 92,137.5 = ½ Total Miles ($\frac{F}{2}$) × Average Load per Trip ($\frac{D+E}{B}$) or ($\frac{F}{2} \times \frac{D+E}{B}$)

Cost per Unit-Mile: Cost per Unit (62) $ .5008 + ½ Round Trip Distance or ($\frac{1}{2} \times \frac{y}{B}$) = (64) $ .0432 Per (Unit) CWT Mile

These Blanks For Use by the Truck Owners' Conference, Chicago. Each ... 4.05; 51 for ... 1.00; 100 for ... 5.00; 500 for ... 10.00; 1000 for 15.00

Capacity	(57) Cost for Period	(A) Days Operated	(61) Cost per Day	(59) Miles per Day	(F) Miles Traveled	(64) Cost per Mile	(62) Cost per CWT	(63) CWT per Mile	(65) Miles per Gallon of Oil
1-ton	$ 3951.67	351	$ 11.26	35	12,285	$ .3217	$ .5008	$ .0432	1.86

Form 19 NATIONAL STANDARD TRUCK COST SYSTEM. TRUCK OWNERS CONFERENCE, INC., 5 S. WABASH AVE., CHICAGO

CHECK SOURCES OF DATA
☐ National Standard System
☒ Individual System
☐ Owner's Records
☐ Owner's Estimates
☐ Investigator's Estimates

No. 4-BEM-5

ANALYSIS OF TRUCK COST

According to National Standard Cost Practice of the Truck Owners Conference
H. P. GOULD, Chairman

Date 7-8-21-X

Owner Cushmans Sons, Inc. Age of Truck at Start of Period

Address 49 Manhattan St., New York City Period Covered 1 year to 6-27-21

Operation Delivery of Bread to Grocers

Truck Capacity ½-ton Make Walker Model Mfgrs. No. Truck No.

Analysis of Operation

A. Number of Days Operated	351	C. Delivery or Pick-up Stops	17,550	E. Total Units	0 In
B. Number of Round Trips	677	D. Total Units	6770 CWT Out	F. Miles Traveled	6775

3A. Investments:		3B. Fixed Expense:	Year Estimated	Mtc. and Repair—Actual as Guide to (35)
(1) Chassis		(11)*Interest, Item (8) 10 Yrs. @ 7 %	130 90	(20)
(2) Storage Battery (if Electric)		(12) Taxes (Property)		(21)
(3) Body		(13) License (State, City, etc.)	20 00	(22)
(4) Top		(14) Administrative Overhead		(23)
(5) Painting		(15) Garage (Rent, Light, Heat, Power)	300 00	(24)
(6) Freight		(16) Insurance	168 00	(25)
(7) Special Equipment				(26)
				(27)
(8) Total	3400 00	(17) Total Fixed Expense per Year	618 90	(28)
(9) Subtract Tire Value	145 10	(17a) Total Prorated for Period	618 90	(29)
(2) Subtract Storage Battery Value	1300 00	(18) Total Fixed Expense per Month (17÷12) (17a÷A)	51 57	(30)
(10) Total (Less Tires and Batteries) to be Depreciated	1956 90	(19) Total Fixed Expense per Day	1 7632	(31)
Present Book Value		*Interest Formula: $\frac{A+1}{A} \times \frac{C \times B}{2}$ In which (A) equals length of working fund period in years. (B) equals the investment. (C) equals the rate of interest.	Period	(32) Total For (32a) Per Mile

Depreciation Total Cost (10) $ 1956.90 For Minimum Life of (33) 87,750 Miles = (34) $ .0223 Per Mile

Maintenance and Repair: Estimated for Period (35) $ 240.00 For (F) 6,775 Miles = (36) $ .0274 Per Mile

Repair Due to Accident: (Not Covered by Insurance): (37) $ For (F) Miles = (38) $ Per Mile

Tire Cost: (9) $ 145.10 For Life of (39) 10,000 Miles By Actual Experience = (40) $ .0143 Per Mile

Fuel Cost: (41) 4071 KWH KW (42) @ 4 ¢ per KWH = (43) $ 162.84 For (F) 6,775 Miles = (44) $ .0186 Per Mile

Cylinder Oil Cost: (45) None Gals. (46) @ ¢ per Gal. = (47) $ For (F) Miles = (48) $ Per Mile

Battery Renewals and Maintenance: (49) $ 260.00 For (F) 6,775 Miles = (50) $ .0296 Per Mile

Total Variable Expense: For Period (51) $ 984.56 (Excluding Driver's Wages) For (F) 6,775 Miles = (52) $ .1122 Per Mile

Total Fixed Expense: For Period (17a) $ 618.90 For (F) 6,775 Miles = (53) $ .0705 Per Mile

Total Driver's Wages: For Period (54) $ 2000.00 (@ (55) $ 5.70 per Day) For (F) 6,775 Miles = (56) $ .2279 Per Mile

Total Cost: For Period (57) $ 3603.46 For (F) 6,775 Miles = (58) $ .4106 Per Mile

Cost per Day, Variable Expense: (52) $ .1122 per Mile × Average Miles per Day (59) 25 = (60) $ 2.8050 Per Day

Fixed Expense: = (19) $ 1.7632 Per Day

Driver's Wages: = (55) $ 5.6980 Per Day

Total Cost per Day: = (61) $ 10.2662 Per Day

NOTE.—To figure the cost on other mileage per day than the average for the period, Item (59), it is only necessary to multiply Item (59) by the number of miles desired, and add Items (19) and (55) which remain the same. Unless operating conditions should be the same, otherwise items (52) will vary.

Cost per Unit: Total Cost for Period (57) $ 3603.46 ÷ Total Units Hauled (D+E) 8,770 = (62) $ .4106 per (Unit) CWT

(Unit) CWT Miles for Period (63) 45,875 = ½ Total Miles ($\frac{F}{2}$) × Average Load per Trip ($\frac{D+E}{B}$) or ($\frac{F}{2} \times \frac{D+E}{B}$)

Cost per Unit-Mile: Cost per Unit (62) $ .4106 + ½ Round Trip Distance or ($\frac{1}{2} \times \frac{y}{B}$) = (64) $ .0820 Per (Unit) CWT

These Blanks For Use by the Truck Owners' Conference, Chicago. Each ... 4.05; 51 for ... 1.00; 100 for ... 5.00; 500 for ... 10.00; 1000 for 15.00

Capacity	(57) Cost for Period	(A) Days Operated	(61) Cost per Day	(59) Miles per Day	(F) Miles Traveled	(64) Cost per Mile	(62) Cost per CWT	(63) CWT per Mile	(65) Miles per Gallon of Oil
½-ton	$ 3603.46	351	$ 10.27	25	6,775	$ .4106	$ .4106	$ .0821	2.15

Complete Analyses of Costs of Deliveries by 1-Ton and ½-Ton Electric Trucks

Such forms as these allow an accurate account of truck costs to be kept. In a logical way costs are divided into variable, fixed and driver expenses and these and their component items are reduced to costs per mile. The cost per day of the three main costs is also determined.

batteries. The average 1-ton electric truck runs 35 miles (56 km.) a day, making one or two trips and about fifty deliveries. Its average load is 1,500 lb. (680 kg.). An allowance is made for two weeks' lay-up per year. As work is done on Sundays, this leaves 351 days on which it is operated.

It is known from experience that these trucks will last ten years, and depreciation is figured on that basis. Repairs and maintenance on the truck average $300 a year. This includes oil and grease and washing daily, as well as repairs and maintenance on the batteries. Charging amounts to $22 a month, at 4 cents per kilowatt-hour. The company does its own charging. Depreciation on the Edison battery is calculated on a five-year basis. Figuring on the "National Standard Truck Cost System," the total operating cost is $11.26 per day, 50.08 cents per 100 lb. (45 kg.) and 4.32 cents per hundredweight-mile.

The ½-ton "electrics" are used for small loads where two or three trips are required daily. These trucks average 25 miles (40 kg.) a day and fifty delivery stops. The average load is 1,000 lb. (450 kg.). They are depreciated on a ten-year basis, and repairs and maintenance come to $240 a year. Charging averages $13.57 per month, and the Edison battery is depreciated on a five-year basis. The driver's wage is the same as for the 1-ton machine. Figured on the "National Standard Truck Cost System," the ½-ton electric costs $10.27 per day, 41.08 cents per 100 lb. and 8.21 cents per hundredweight-mile. These are the bare trucking costs and do not include overhead on delivery service.

Costs on the 5-ton "electrics" are not available at this time, but it is known that they have proved cheaper than horses or gas trucks for hauling flour.

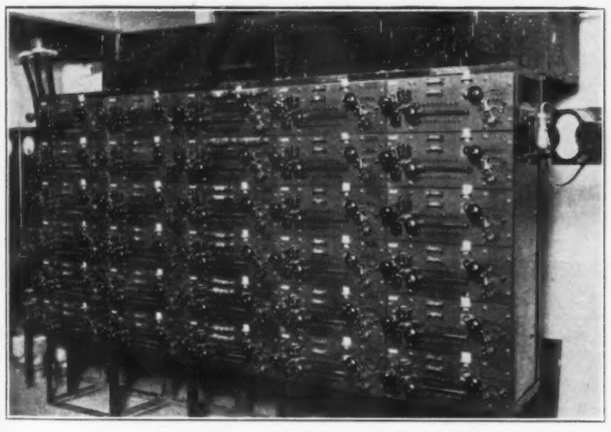
As soon as the sphere of electric trucks was determined the company began to displace the horses and light gas trucks which were operating in the electrics' zone. The "electrics" proved cheaper than either horses or gas trucks, but they saved more as compared with the gas trucks than as compared with the horses. It is estimated conservatively that the electric trucks have saved $100,000 in two years as compared with what the delivery cost would have been if they had displaced only light gas trucks. The actual saving is somewhat less than this because some of the "electrics" displaced horses.

At present the hauls made by the "electrics" are considerably longer than those made by horses, yet the cost per unit delivered is only 2 per cent or 3 per cent greater for the electric trucks than for the horses. As a result of six years' experience, the company is fully satisfied that the electric vehicles are the most economical hauling unit for the range in which operated.

Electric trucks are also more satisfactory for other reasons. They are easier to operate and take care of, and their cleanliness is a great advantage in this class of work. The driver who delivers the bread to the customer does not get grease on his hands, and the trucks give out no odor of gasoline and oil to contaminate the bread or flour. Repairs on the electric trucks are very light, averaging only half the cost of repairs for a gasoline truck. Repairs can be made more quickly, too.

The fact that the speed is limited to 14 miles (22 km.) per hour is really an advantage, for it results in lower repairs and tire cost and fewer accidents. With gas trucks the accidents are easily twice as many. The life of an "electric" is double that of a gas truck because of its low speed and simplicity of construction.

The choice of the proper storage battery for electric trucks is very important. More than half of the batteries are nickel-iron type, and the same make is specified for fifteen of the twenty trucks now on order. This make of battery is used for two reasons—first, because they have a very long life, and, second, because they weigh about 600 lb. (270 kg.) less than others for the size of trucks used. It is found that other makes of battery last about three and one-half years. The oldest nickel-iron cells have been in service only two years, so their life cannot be prophesied from past experience. Their low weight naturally adds to the carrying capacity of the trucks. A 600-lb. load saved on a truck rated at 2,000 lb. (900 kg.) increases its capacity 30 per cent.



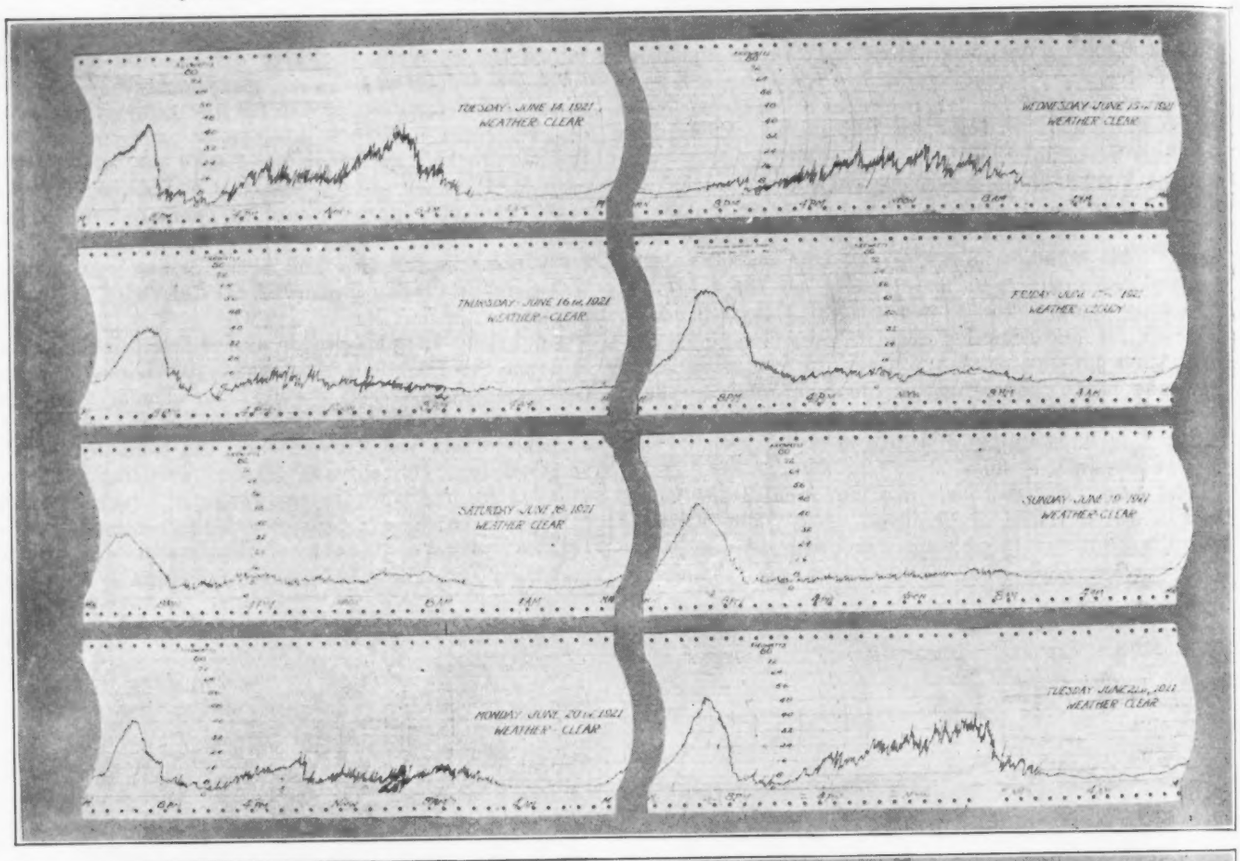
ONE-TON AND ½-TON DELIVERY TRUCKS ARE CHARGED AT A COST OF 2.2 AND 1.9 CENTS PER MILE RESPECTIVELY

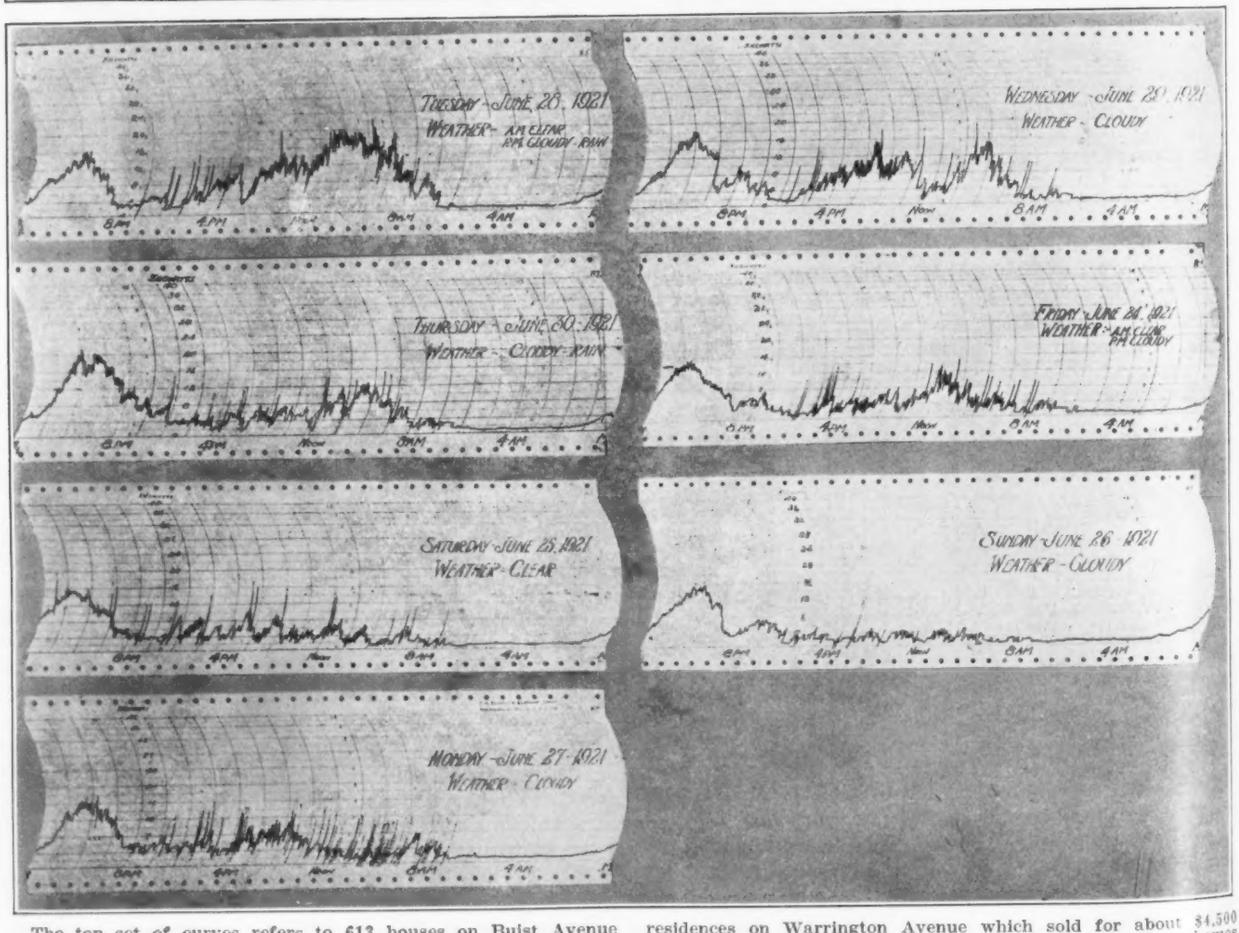
COSTS OF DELIVERIES BY ELECTRIC TRUCKS

Each truck worked 351 days per year delivering bread to grocers, making about 17,550 stops per year.

	½-Ton Truck		1-Ton Truck	
Miles Traveled per Year	8,775		12,285	
	Per Mile	Per Day	Per Mile	Per Day
Depreciation	$0.022	$0.557	$0.018	$0.640
Maintenance and repair	0.027	0.685	0.024	0.839
Tire cost	0.014	0.358	0.016	0.560
Charging cost	0.019	0.465	0.022	0.769
Battery renewals and maintenance	0.030	0.740	0.026	0.909
Total variable expense	$0.112	$2.805	$0.106	$3.717
Total fixed expense	0.071	1.763	0.053	1.843
Driver's wages	0.228	5.698	0.163	5.698
Total cost	$0.411	$10.266	$0.322	$11.258

Analysis of Residence Loads Shows Effect of Domestic Appliances




TUESDAY - JUNE 28, 1921
WEATHER - AM CLEAR PM CLOUDY RAIN
WEDNESDAY - JUNE 29, 1921
WEATHER - CLOUDY
THURSDAY - JUNE 30, 1921
WEATHER - CLOUDY RAIN
FRIDAY JUNE 24, 1921
WEATHER - AM CLEAR PM CLOUDY
SATURDAY JUNE 25, 1921
WEATHER - CLEAR
SUNDAY JUNE 26 1921
WEATHER - CLOUDY
MONDAY - JULY 27, 1921
WEATHER - CLOUDY

The top set of curves refers to 613 houses on Buist Avenue which were constructed during the war and rented chiefly to mechanics. The bottom set indicates conditions in 370 higher class residences on Warrington Avenue which sold for about $4,500 before the war. For classification of appliances in these homes see table on page 665.

Residence Load Factor Doubled by Use of Household Appliances

Survey of the Appliance Load in More than 1,300 Dwellings in Philadelphia Indicates that the Day Load Can Be Appreciably Increased Without Additional Expenses in the Way of Investment for Poles, Lines and Transformers by Intelligent and Energetic Promotion of Electrical Merchandise Sales

THE amount of electricity consumed by labor-saving appliances in the household has always been the subject of considerable speculation, so that the survey recently conducted in Philadelphia and reported before the fortieth convention of the Association of Edison Illuminating Companies by C. J. Russell and P. W. Berger should be of considerable interest to all executives and business men engaged in central-station work. In this survey comprehensive figures were collected on the relation of the electric appliance consumption to the electricity consumed by lamps in the homes of more than 1,300 average families. Great care was exercised in conducting the tests so that the results would be indicative of average conditions and not of a selected class. As a result of the investigation the authors of the reports have concluded that not much increase in revenue can be expected from residences already on the circuit because of greater use of energy for illumination and that improvement of the load factor and increase in revenue will have to come from the general introduction of domestic appliances.

ENERGY CONSUMPTION BY APPLIANCES APPROACHING THAT BY LIGHTING

The logic of the conclusion is fairly well proved by the fact that the Philadelphia Electric Company has apparently doubled the energy consumption of its residences during the summer months by intelligent and energetic promotion of electrical merchandise sales. The increase in load factor has been obtained without additional expense in the way of investment for equipment such as poles, lines and transformers, so that it has cost virtually nothing to get this daylight load aside from the sales promotion expense. Such results could never have been had, the author concluded, by placing heavy-duty devices on the residence lines, since they would require reinforcing distribution lines, transformers and other apparatus. The time is rapidly approaching, they contend, when the consumption of household appliances will be more than 50 per cent of the residence load.

In order that the survey should be representative of average conditions four groups of residences, which were served from transformers carrying no power loads, were selected. Six hundred and thirteen of these homes, which were on Buist Avenue, were constructed during the war and were sold or rented to mechanics, most of whom worked at the Hog Island shipyard. The second group, consisting of 370 homes, was on Warrington Avenue and involved homes that sold for approximately $4,500 just prior to the war. These homes are occupied by people in moderate circumstances. The third block was selected on Wyoming Avenue and consisted of 269 of the oldest modern homes in the city, most of which were erected about ten or twelve years ago and have been wired for that length of time. The last group consisted of eighty-eight homes of well-to-do persons on Lincoln Drive.

By actual count it was found that there were 728, 522, 655 and 321 appliances in these groups respectively, making a total of 2,226. The classification of appliances is given in the table. From this tabulation it will be noted that 41.2 per cent of the appliances are flat-irons, 28.7 per cent vacuum cleaners, 8.4 per cent washing machines, 7 per cent toasters, 4.2 per cent fans, 2.6 per cent sewing machines and an equal percentage percolators. The average numbers of appliances in the Buist, Warrington, Wyoming and Lincoln groups were respectively 1.21, 1.4, 2.43 and 3.73.

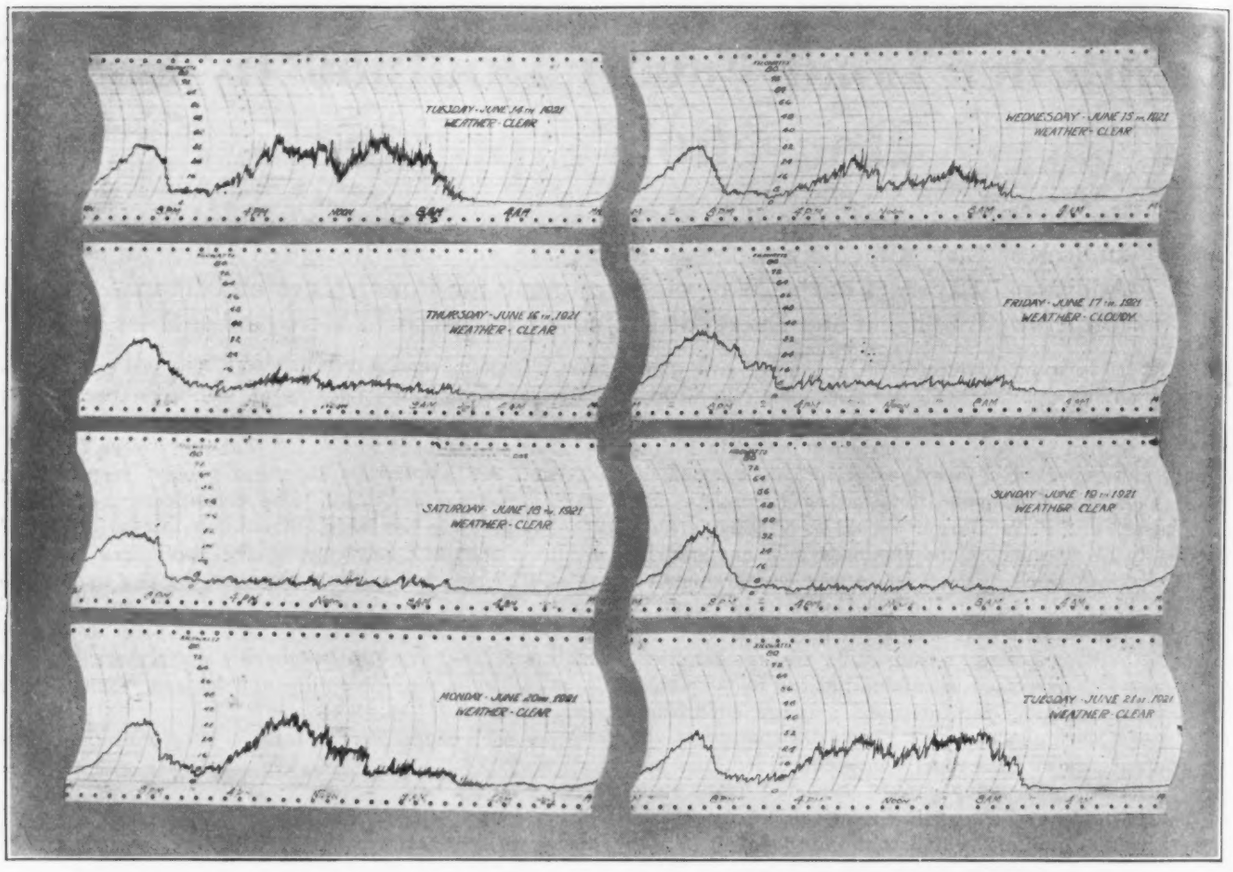
Since each group of residences is supplied by a single-phase transformer, it was possible to study the load variations each day of the week by connecting graphic instruments in the transformer circuit. Records from these instruments for each of the groups are shown on pages 664 and 666.

From the Buist Avenue chart it will be observed that the appliance load started at 8 a.m. and reached its high point about the middle of the forenoon, tapering off after noon but still holding a fairly high line up to 4 p.m., when it broke off rather sharply. At 8 p.m. the lighting load is at its peak but is not much higher than the peak of the day appliance load, and its duration is not nearly so long. Between 7 a.m. and 7 p.m. on Tuesday there was a total of 291 kw.-hr. consumed, and from

CLASSIFICATION OF APPLIANCES IN ACTIVE USE IN RESIDENCES SURVEYED

Kind of Appliance	Location of Residence: Lincoln Drive	Wyoming Avenue	Warrington Avenue	Buist Avenue	Total No. of Appliances	Per Cent of Total
Irons	79	233	222	384	918	41.2
Cleaners	74	221	148	196	639	28.7
Washing machines	28	74	19	66	187	8.4
Toasters	36	44	52	25	157	7.1
Fans	32	26	23	12	93	4.2
Percolators	17	17	16	7	57	2.6
Sewing-machine motors	13	11	13	20	57	2.6
Heaters	6	14	2	4	26	1.2
Waffle irons	4	4	9	2	19	0.85
Curling irons	8	0	5	3	16	0.72
Vibrators	2	5	7	1	15	0.67
Heating pads	6	1	0	1	8	0.36
Mangles	5	0	0	1	6	0.27
Chafing dishes	0	3	1	0	4	0.18
Piano motors	2	0	1	1	4	0.18
Disk stoves	3	0	0	0	3	0.13
Grills	0	1	0	2	3	0.13
Victrola motors	2	1	0	0	3	0.13
Meat grinders	0	0	2	0	2	0.09
Bottle warmers	2	0	0	0	2	0.09
Violet ray	1	0	1	0	2	0.09
Hair dryers	0	0	0	1	1	0.04
Boilers	0	0	1	0	1	0.04
Fireless cookers	0	0	0	1	1	0.04
Plate warmers	1	0	0	0	1	0.04
Soda pumps	0	0	0	1	1	0.04
Totals	321	655	522	728	2,226	100.00

Comparison of Weekday and Sunday Loads Indicates Appliance Load


TUESDAY · JUNE 14TH 1921
WEATHER · CLEAR
WEDNESDAY · JUNE 15TH 1921
WEATHER · CLEAR
THURSDAY · JUNE 16TH 1921
WEATHER · CLEAR
FRIDAY · JUNE 17TH 1921
WEATHER · CLOUDY
SATURDAY · JUNE 18TH 1921
WEATHER · CLEAR
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MONDAY · JUNE 20TH 1921
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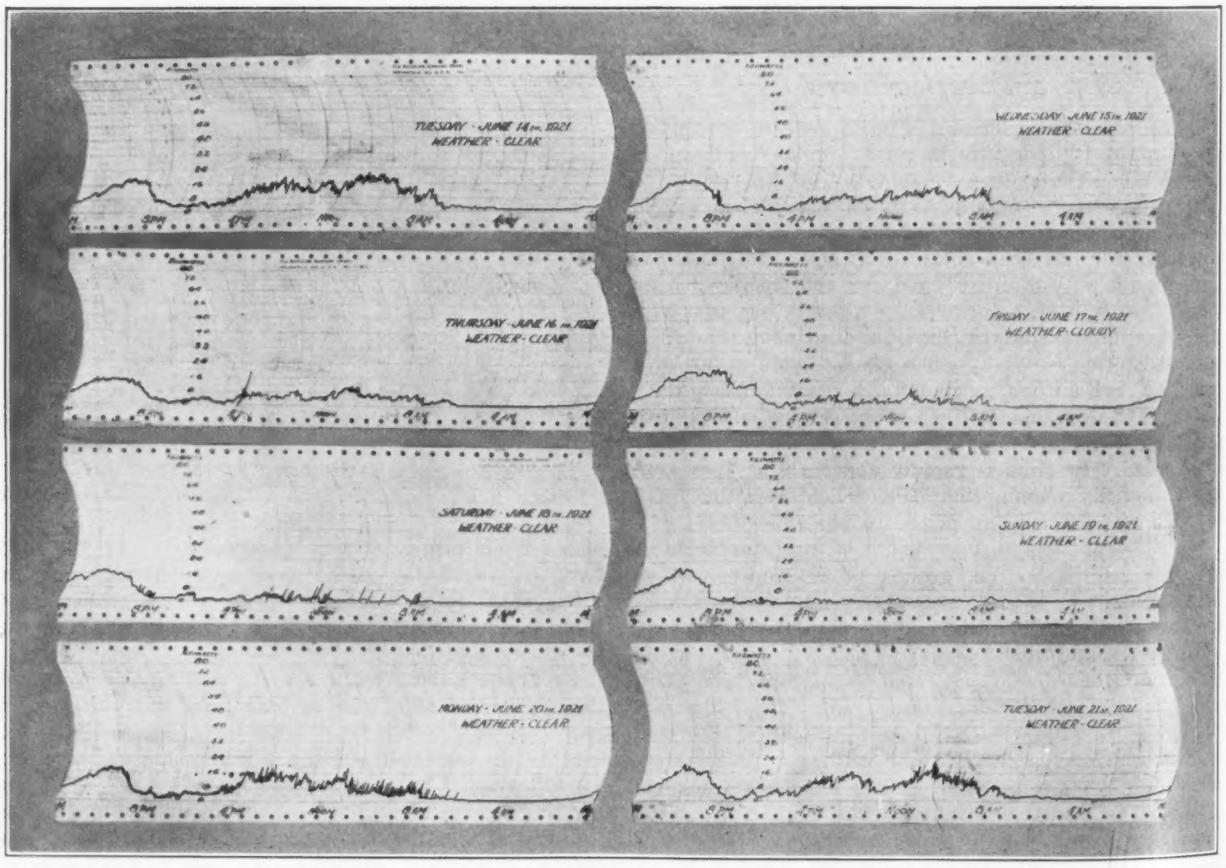
TUESDAY · JUNE 21ST 1921
WEATHER · CLEAR


TUESDAY · JUNE 14TH 1921
WEATHER · CLEAR
WEDNESDAY · JUNE 15TH 1921
WEATHER · CLEAR
THURSDAY · JUNE 16TH 1921
WEATHER · CLEAR
FRIDAY · JUNE 17TH 1921
WEATHER · CLOUDY
SATURDAY · JUNE 18TH 1921
WEATHER · CLEAR
SUNDAY · JUNE 19TH 1921
WEATHER · CLEAR
MONDAY · JUNE 20TH 1921
WEATHER · CLEAR
TUESDAY · JUNE 21ST 1921
WEATHER · CLEAR

The upper set of curves indicates conditions in 260 of the oldest modern homes on Wyoming Avenue, Philadelphia, which have been wired for ten to twelve years. The lower set refers to eighty-eight homes of well-to-do families on Lincoln Drive, where less economy in use of electricity for lighting is practiced. For classification of appliances in these homes see table on page 665.

7 p.m. to 7 a.m. the consumption was only 131 kw.-hr. It may be observed that the day load gradually decreased during the week after reaching its peak on Tuesday.

Monday is the day on which comparatively few appliances are used in the home, the total output for this group being only 79 kw.-hr. during the day, as compared with 159 kw.-hr. at night. This confirms the theory upon which the survey was based, namely, that the daily energy consumption in excess of the Sunday consumption can be safely assumed to be due only to the appliance load. Taking a whole week into consideration, the total day consumption is 907 kw.-hr., as compared with 949 kw.-hr. at night.

The survey of the Warrington Avenue group indicated similar conditions to those on Buist Avenue. On Tuesday the day load was 119 kw.-hr., as compared with 52 kw.-hr. at night, whereas on Sunday the day load was 33 kw.-hr. and the night load 59 kw.-hr. The total for the week figured 455 kw.-hr. during the day and 408 kw.-hr. during the evening.

Somewhat different conditions existed in the Wyoming Avenue group, for the Tuesday day load there was 209 kw.-hr. as compared with 119 kw.-hr. at night. On Wednesday the day output was about 146 kw.-hr., against 111 kw.-hr. at night. On Monday the day output was 208 kw.-hr. and the night output 122 kw.-hr., bringing the total figures up to the point where the day load was 941 kw.-hr., which overbalanced the night load of 865 kw.-hr. for the whole week.

The conditions found in the Lincoln Drive residences were different from those in the rest of the homes, as would be expected, owing to the fact that servants are employed largely in these houses and hence there is less economy in the use of energy for illumination than in the other homes. The lighting load, therefore, is relatively a greater portion of the total than in the other groups. This accounts for the kilowatt-hour consumption during the day being somewhat less than that at night.

TUESDAY HAS HEAVIEST DAY LOAD

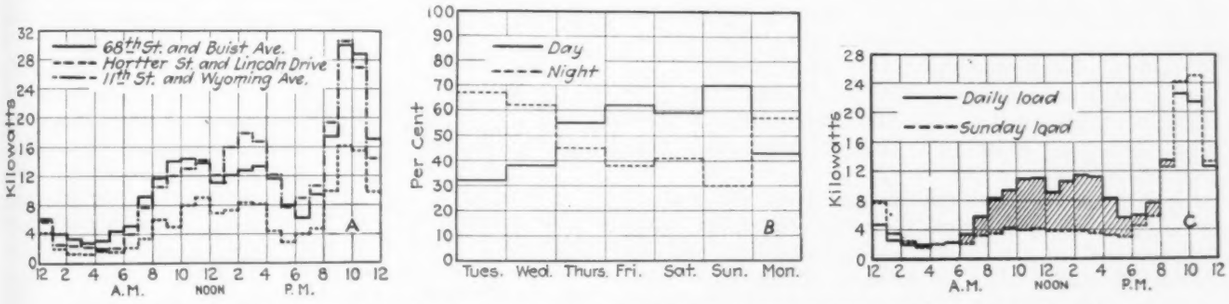
A comparison of the average daily load in the districts appears in the above curves. In studying this survey it should be remembered that the Buist Avenue homes were relatively poorly equipped with appliances and that the Lincoln Drive homes were much better equipped.

Composite curves showing the relation of the load on each day during the week to the Sunday load and to the average weekday load were presented in the original papers by C. J. Russell and T. W. Berger, but they cannot be reproduced here for lack of space. However, it might be pointed out that the general observation would be that Tuesday is the day of largest appliance-load consumption, the peak occurring slightly after 10 a.m. Monday is next in magnitude, with a peak slightly after 2 p.m. Wednesday, Thursday, Friday and Saturday are very similar in many respects, the day load being relatively flat-topped, with a slight valley immediately after noon. On Saturday the day load is at its lowest ebb for any weekday, but even on Saturday it is higher than on Sunday.

DAY LOAD GREATER THAN NIGHT LOAD

One of the most interesting relationships is shown by the composite curves at the center showing percentage of kilowatt-hours used during day hours and night hours for each day during the test in the four locations. Commencing with Tuesday, which shows the highest day load, owing to its being the universal ironing day, it may be observed that 67 per cent of the total energy consumed was used during the day. On Wednesday the daylight load was 62 per cent of the total; on Thursday 45 per cent, on Friday 38 per cent, on Saturday 48 per cent and on Sunday 30 per cent, while on Monday it was 57 per cent.

In summing up the whole survey, it was found that in more than 1,300 average homes in Philadelphia 51.1 per cent of the total output of energy was consumed from 7 o'clock in the morning until 7 at night and 49.9 per cent from 7 at night to 7 in the morning. To determine how much of the daylight consumption is due to appliance load, it was assumed that the daylight load on Sunday is due to illumination. Although this is not actually true, it was nevertheless taken as a basis in order that the conclusions should not be too favorable to the value of the appliance load. On this basis the average daily load for the four districts was plotted in comparison with the average Sunday load for the same district, as shown on the right. On the basis of the assumption made, the cross-hatched area represents the net appliance load, which comes to 33.5 per cent of the total. Owing to the nature of the assumption, the authors of the report believe that this should show conclusively the minimum amount of energy consumed by appliances in the houses covered by the test. From this survey it was concluded that the load factor of the four locations combined was virtually doubled by the use of household appliances.



COMPARISON OF AVERAGE DAILY LOAD AND ENERGY CONSUMPTION FOR GROUPS OF RESIDENCES STUDIED

A—Indicates the average daily loads (Sunday excluded) in three of the residence groups referred to in this article. It may be observed that the daylight-energy consumption is a considerable portion of entire consumption. B—Composite curves showing relation of average daylight consumption to average night consumption for each day of test at four locations. C—Superposition of average day load curves on Sunday curve indicates energy consumption (cross-hatched area) fairly attributed to appliance load.

Bearing of Illumination Intensity Upon Efficiency of Visual Operations

For Such an Operation as Reading the Average Observer Chose a Greater Intensity of Light When Using the Mercury Arc than When Using Tungsten Lamps—Results Indicate the Value of Higher Illumination Values than Are Ordinarily Used

By M. LUCKIESH, A. H. TAYLOR and R. H. SINDEN

SOME investigations that should be of considerable interest to industrial-plant engineers and all who specify or recommend lighting equipment have been carried out recently at the Laboratory of Applied Science, National Lamp Works, Nela Park, Cleveland. The tests* indicate the relation between intensity of illumination and efficiency of visual operations and hence have an important bearing on the effect of illumination on industrial production. The effect of spectral distribution upon desired illumination has also been investigated.

Lest some one who has not closely followed the literature on the subject should get the impression from the foregoing that intensity is everything in illumination, the writers wish to emphasize that many other factors must be taken into account. For instance, contrast, distribution of illumination, spectral character and color of light, specular reflection, etc., must have equal consideration.

Recently particular attention has been directed to various psycho-physiological factors, such as the speed of discrimination, the influence of color of light and the general effect of higher intensities. While it has been definitely established by Ferree and Rand† that increase in light intensity above the minimum required has considerable influence on speed of discrimination, ability to sustain clear seeing, etc., the Laboratory of Applied Science desired to obtain definite data on the relation between spectral character, intensity and efficiency of operations. The method of conducting the tests to determine this information and the results obtained are presented briefly in this article.

In general it has been found: (1) That the speed of visual discrimination for reading matter of high and of low contrast increased with an increase in illumination intensity; (2) that for such a visual operation as that of reading the average observer chose a greater intensity of light from the mercury arc than of light from the tungsten lamp, and (3) that the chosen intensity increased with an increase in the maximum intensity available. The results indicate the value of illumination intensities of higher value than those ordinarily used. They also show that for most visual operations the light from the mercury arc does not have the advantages indicated by former tests with details so small as to be at the threshold of discrimination.

The central idea in the development of the apparatus for the investigation was the evolution of a test which would be closely related to the conditions encountered in practice and which would give a direct reading of the change of efficiency resulting from a change in illuminating intensity. The arrangement of the apparatus for the study of speed of discrimination is shown in Fig. 1. The test material (reading matter) was placed around a cylindrical drum driven by a small motor. In front of the drum was a screen having approximately the same reflection factor as the background of the material on the drum. This screen had a narrow horizontal slit which exposed about three lines of type. The light-source, which consisted essentially of a 75-watt gas-filled tungsten lamp back of a diffusing glass screen, was so arranged that the intensity of illumination on the test object and the screen could be controlled without change of color of the light and with no lack of uniformity.

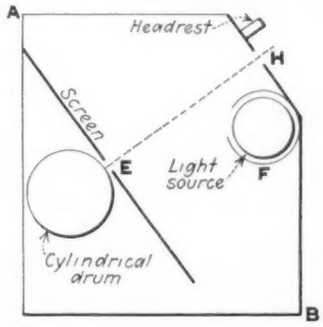


FIG. 1—APPARATUS FOR CONDUCTING VISUAL DISCRIMINATION TESTS

The observer viewed the test material on the drum through opening *H*, resting his forehead against the headrest. Extraneous light was kept out by black metal shields. The distance from the eyes to drum was approximately 16 in. (40 cm.). The speed of the drum was regulated by two rheostats in series, one of which was under control of the observer. Speeds were

*The complete report of these researches will appear in an early issue of the *Journal* of the Franklin Institute.

†*Transactions Illuminating Engineering Society*, Vol. XV, page 769, 1920.

TABLE I—READING TESTS SHOW 3.5 TO 20 PER CENT HIGHER INTENSITY REQUIRED WITH MERCURY ARC THAN WITH GAS-FILLED TUNGSTEN

Test No.*	No. of Observers	Max. Illumination Obtainable (foot-candles)	Foot-candles Chosen by Group Mercury-Arc Mean	Mercury-Arc Median	Gas-Filled Tungsten Mean	Gas-Filled Tungsten Median	Illumination Ratio Mercury Arc ÷ Gas-Filled Tungsten: Ratio of Means	Ratio of Medians	Mean of Individual Ratios	Median of Individual Ratios	Probable Error of Mean of Individual Ratios
1	22†	10	6.3	6.5	5.3	5.6	1.19	1.16	1.20	1.20	0.030
2	55	30	14.2	13.5	12.7	12.3	1.12	1.10	1.175	1.14	0.019
2a	24	30	11.8	10.5	10.6	9.6	1.115	1.095	1.16	1.15	0.012
3	26	30	18.0	17.8	17.4	16.0	1.035	1.11	1.065	1.07	0.014
4	24	45	16.9	16.2	16.1	14.7	1.05	1.10	1.10	1.04	0.012

* For reading material see table II.

† Fifteen of these observers repeated, and to their second observations the same weight has been given as to the observations of different observers. The same observers were used in Tests 2a and 4. Results of Test 2a are included in Test 2.

measured by an automobile speedometer out of sight of the observer.

Many test materials were tried, but the most satisfactory was found to be Old English type. Unfamiliarity with this type makes it especially suitable, as discriminability plays a more important part in reading it and close inspection is necessary for recognition of words. Photographic copies of such material, reduced to approximately 8-point type size, were made. Columns were 1¼ in. (3.13 cm.) wide, and two columns of such material were pasted onto the drum. In many industrial processes brightness contrasts encountered are fairly low; hence to approximate this condition the prints were made on fogged paper, resulting in a background having a reflection factor of about 22.5 per cent. A later test was made with the same material on a white background having a reflection factor of approximately 80 per cent. These are hereafter referred to as "low" and "high" contrast material respectively.

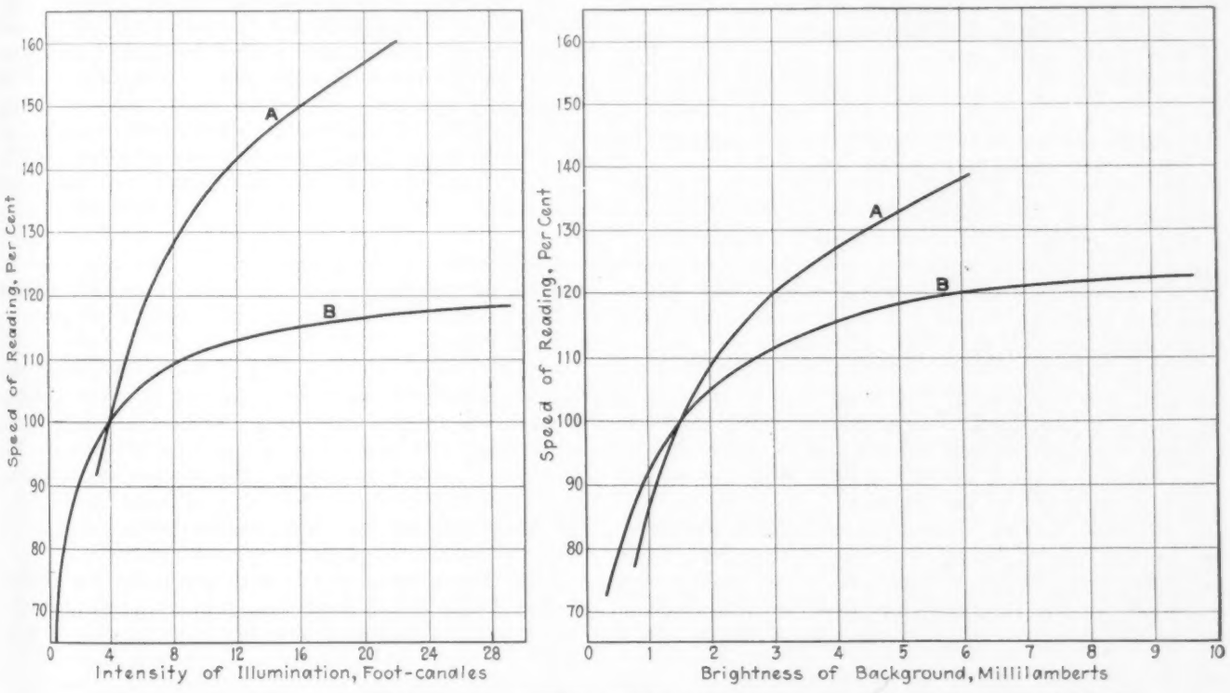
Observations were made at four different intensities of illumination. For the low-contrast test object these were 3.12, 6.25, 12.5 and 25 foot-candles, and for the high-contrast they were 0.39, 1.56, 6.25 and 25 foot-candles. Each observer started the observation with the lowest illumination and adjusted the speed so that when reading the material aloud neither edge of the slot intercepted the line being read. After reading for several minutes until the rate of reading became constant, the speed of the drum was observed; then the illumination was increased to the next step and a new setting made. To avoid prejudice in the speed regulation a second person changed the other rheostat in a haphazard manner between observations. Each observer went through the cycle from low to high and then back to low illumination, and the two observations at each illumination were averaged to correct for the effect of increasing familiarity with Old English type.

Individual observers varied in speed of reading over a wide range. For convenience in combining results each observer's speed at an illumination of 4 foot-candles has been rated at 100 per cent, and the combined results for forty-nine observers for the low-contrast material are shown in curve A, Fig. 2. The results for thirty-seven observers with the high-contrast material are shown by curve B, Fig. 2. The same data are shown in another way in Fig. 3, where percentage speed is plotted against brightness of the background; the speed at a brightness of 1.5 millilamberts is taken as 100 per cent.

The second research was carried out to determine the effect of spectral character of the light on the intensities chosen by different observers for reading. The researches of Bell‡ and of Luckiesh§ have shown that visual acuity in monochromatic or nearly monochromatic light is higher than in light having an extended spectral distribution. These results are most noticeable for small details at low illumination. In ordinary operations, such as reading, the eyes are seldom called upon to distinguish very fine details at the limit of discrimination. In reading it has been shown that the eyes progress along the line of type by successive jumps and pauses and that the eyes see words as a whole rather than notice individual letters.

In view of these and other facts it appeared desirable to carry out further tests to determine whether visual acuity is an important factor in the illumination intensities required by various observers for reading, since this is a very important and representative application of vision.

The nearest approach to monochromatism in any commercial illumination is obtained in the mercury-vapor arc; hence the logical choice of illuminants for



FIGS. 2 AND 3—SPEED OF DISCERNMENT AT DIFFERENT LIGHT INTENSITIES AND BRIGHTNESS OF BACKGROUND
A—Using low-contrast material; averaged for forty-nine observers. B—Using high-contrast paper; averaged for thirty-seven observers.

‡ELECTRICAL WORLD, May 11, 1911; Sept. 9, 1911.

§ELECTRICAL WORLD, Aug. 19, 1911; Nov. 18, 1911; Vol. 62, 1913, page 1150. *Transactions I.E.S.*, Vol. VII, 1912, page 135.

such a test would be mercury arcs and gas-filled tungsten lamps.

In order to obtain uniform illumination on the reading matter a glass-tube mercury arc with reflector and gas-filled tungsten lamps in a white-lined container were prepared. In the earlier tests these were mounted in an office room with light ceiling and buff walls. They were placed behind and to the left of the observer, who was seated at a table. The reading matter was placed

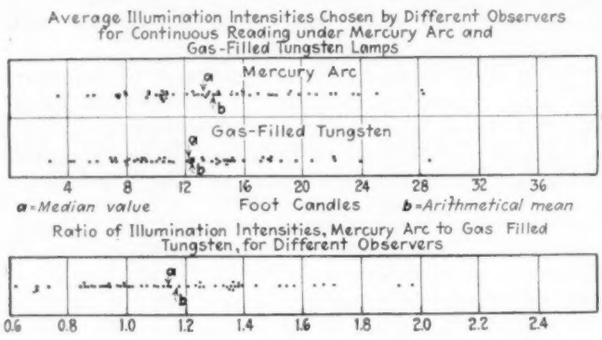

Average Illumination Intensities Chosen by Different Observers for Continuous Reading under Mercury Arc and Gas-Filled Tungsten Lamps
Mercury Arc
Gas-Filled Tungsten
a
b
4 8 12 16 20 24 28 32 36
a=Median value
Foot Candles
b=Arithmetical mean
Ratio of Illumination Intensities, Mercury Arc to Gas Filled Tungsten, for Different Observers
0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4

FIG. 4—RESULTS OF TYPICAL TEST (NO. 2A) PLOTTED

on an inclined rest in front of the observer. The illumination from each source could be varied by the observer by means of strings attached to shutters in front of the cabinets containing the lamps. Variation of the illumination on the reading matter was accompanied by a similar variation in the general illumination of the room received from the same source.

In this test (referred to in the tables as Test 1) each observer when seated at the table was instructed to adjust the illumination to an intensity which he would consider comfortable and desirable if he were to continue reading without eye strain for a period of several hours. The intent of the instruction was that the observer should not use the minimum possible intensity, but neither should he be wasteful of the light. The observer readjusted the illumination at the end of every five minutes for a period of thirty minutes. Later in the day observations were repeated with the other source.

For the larger portion of the later work the mercury source was a 50-in. (125-cm.) glass tube arc with reflector. Ten gas-filled tungsten lamps were placed in a white-lined box, 15 in. x 36 in. x 9½ in. (45 cm. x 90 cm. x 23.8 cm.) in size, with opal-glass front. This made the sources more nearly comparable as regards diffusion. These units were suspended about 5 ft. (1.5 m.) above a table placed near one corner of a large room. Control of illumination was obtained by means of two roller curtains on each source, which cut off the light by unrolling from both ends of the illuminant, this control being in the hands of the observer as before. Data on the reading matter used in each test are given in Table II. In order that all observers should receive identical instructions, written directions as follows were given to each:

TABLE II—DATA ON READING MATERIALS USED IN TESTS

Test No.	Reading Material	Apparent Diffuse Reflection Factor (Per Cent)	Size of Type (Points)	Lines per Inch
1	*Transactions I. E. S.*	84	11	6
	"Life of Edison"	89.5	12	5.6
2 or 2a and 4	*Scientific American Monthly*	80.5	9	7.2
3	*Saturday Evening Post* (dyed)*	†41	9	9
	Saturday Evening Post (dyed)			

*The dye used in dyeing the *Saturday Evening Post* was somewhat bluish, which accounts for the higher reflection factor obtained for illumination by the mercury-vapor lamp. If this correction were applied to the results in Table I, all ratios for test No. 3 would be raised about 4 per cent.
†42.5 for mercury-vapor light.

INSTRUCTIONS FOR READING TEST

The object of this test is to measure the intensity of illumination most satisfactory for continued use in reading. This does not mean an intensity with which it is just possible to get along, but rather one which seems comfortable and desirable.

In commencing the test the observer will read for a period of four minutes under a selected intensity of illumination. He will then be instructed to adjust the light to suit his own taste, and in doing so will bear in mind the above-mentioned objective. At the end of each four-minute period the observer will be instructed to readjust the light.

The selected intensity referred to was 4 foot-candles. Observations under each source continued for sixteen minutes, and observations under one followed immediately after those under the other. The order of the illuminants was reversed for successive observers.

Photometric measurements were made by two or three observers. A calibration curve relating shutter position and illumination was determined for each illuminant. Frequent checks of the calibrations were made.

The results of the various tests, with data on the reading materials, are given in Tables I and II. A plot of the results of Test 2, which is typical of all tests, is given in Fig. 4.

In every test the maximum illumination obtainable was kept approximately the same for the two sources. It appears from Tests 2a and 4 that the intensity chosen by an observer is influenced to some extent by the maximum intensity available. Intensities higher than 45 foot-candles could not be obtained with the mercury arc used; hence it was not possible to investigate the effect of maximum intensities greater than this.

These tests seem to show conclusively that visual acuity is not the determining factor in choosing an illumination intensity for reading. On the contrary, in all of the tests the average intensity chosen under the mercury arc exceeded the average tungsten-lamp intensity by 4 to 20 per cent, whereas it has been shown that at lower intensities about 75 to 95 per cent more tungsten light than mercury light was required for equal visual acuity; that is, where the details are so small as to be just distinguishable. The actual intensity which would be chosen by the average observer if the available intensity were unlimited is unknown, but where intensities of the order of 30 to 45 foot-candles are available an intensity of 10 to 17 foot-candles seems to be satisfactory.

Hydro-Electric Power in Ceylon

RAILROAD electrification, street-railway construction and lighting important towns would, the authorities of Ceylon estimate, afford ample use for development of the hydro-electric resources of the island, and surveying and other preliminary work is now under way. There are also tea, rubber and other factories which would probably become consumers of energy, and electrochemical works are within the possibilities. The consulting engineers have advised the government to develop the power as a public enterprise but to intrust the distribution of the energy to private interests.

Readers' Views and Comments

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Need for Popular Enlightenment in the Contest Between Light and Illumination

To the Editors of the ELECTRICAL WORLD:

A battle is being waged in the electric industry over light versus illumination. The average layman has a growing desire for the former and a hazy idea of the latter. In my locality this is exemplified in a marked manner. Lamps rated as high as 150 watts are hung over store counters in the direct line of vision of clerk and customer. A customer passing from such a store to one filled with soft illumination will often criticise the lighting of the second store and contrast it with the other man's "bright light." It is safe to say that ignorance is the direct cause for this everyday remark—the ignorance of the average layman on the fundamentals of illumination coupled with the psychological effect produced on his mind by seeing the burning filament.

Electrical men have educated the layman to see the advantage of electric light in comparison with oil and gas. Yet is he not ignorant of the power of the illuminant he is now employing? Is he not, in fact, often guilty of "running a good thing into the ground"? Should not electrical men, having proved the superiority of electricity to other forms of light, discourage this mad rush after glare and strive to show that correct lighting—illumination—is that happy medium where light is present in the right amount but vision is not impaired? J. B. FICKLEN, III.

Rappahannock Electric Light & Power Company,
Rappahannock, Va.

Disputes Industrial Court's Idea of Coal Mining Operations in Kansas

To the Editors of the ELECTRICAL WORLD:

In your issue of Aug. 27 appears an article under the heading "Kansas Industrial Court Declares Mining Methods Wasteful." I wish to say that I have been in a number of mines that are fully equipped electrically, some that are partly equipped and a number that have no electrical equipment. My observation covers a period of more than three years and I cannot agree with the opinion of the Kansas court. In the mines that are electrically equipped the men are surprisingly quick to pick up the handling of electrical equipment, locomotives, electric shot-firing machines, mining machines, pumps, hoists, drills, etc., and quite efficiently, too. In this field the coal is 2 ft. 6 in. to 3 ft. 6 in. and very hard shooting. It is full of sulphur, "horsebacks," "faults" and "rash," which causes dirty coal that is either loaded out or "gobbed." This time is lost to the company and has to be paid for. The companies are not operating mines for their health, and unless they were very efficiently operated they could not be run at anything but a loss.

The statement that a miner or any one else can by simply drilling a hole in the face of the coal and putting in a stick of dynamite blow out several tons of coal is erroneous—in the first place because such a method would likely not shoot down a dinner-pail-full of coal, but would simply spring the hole. It would probably be a "windy" shot, and the method is against the law. The shot firers, as a rule, are quite intelligent or they would not live to fire many shots; so, needless to say, they would not fire that kind of a shot. When shooting off the "solid," a cutting is made by the miner to give the shots a chance. Usually a 3-ft. cutting is put in, or the shot firers would not light the shot. After a man drills two or three holes, which requires considerable labor, he wants some coal to load out the next day. He uses black powder or a permissible explosive. The holes could be loaded as the court states and fired the next day with smaller results than he got the first day.

The Sheridan Coal Company, CHARLES LELAND.
Mulberry, Kan.

Rating-Plate Material

To the Editors of the ELECTRICAL WORLD:

Until the last few years the rating plates on motors, generators, transformers and other electrical equipment, which carry the information recommended by the American Institute of Electrical Engineers for record in this way, have been made of brass or copper. Of late a few manufacturers have been using steel rating plates. The object of the rating plate is to provide a permanent record of certain information regarding the apparatus to which it is attached, otherwise a cardboard tag tied to the machine would be sufficient. A thin sheet of steel may last longer than a paper tag in some locations, but there are many others where it is not so durable.

In a plant having in operation 1,000 or 1,200 motors, many of which look much alike, it is a pretty hard matter at times to identify one when the frame bears a rectangular patch of rust for a rating plate. If all electrical manufacturers will again return to the use of non-ferrous nameplates on their products, their action will be appreciated by their customers.

Jones & Laughlin Steel Co., D. W. BLAKESLEE,
Pittsburgh, Pa. Electrical Engineer.

A Correction

To the Editors of the ELECTRICAL WORLD:

The table for 25 cycles on page 419 of the Aug. 27 issue of the ELECTRICAL WORLD in the writer's article on "Quick Line Calculation Without Charts or Tables" is in error as will be obvious to any one who checks up the calculations. The table should read as follows:

For 25 cycles:

No.	8	W	=	130	−	(13 × 8)	=	26
No.	7		=	130	−	(14 × 7)	=	32
No.	6		=	130	−	(15 × 6)	=	40
No.	0		=	130	−	(15 × 0)	=	130
No.	00		=	130	+	(30 × 1)	=	160
No.	000		=	130	+	(30 × 2)	=	190
No.	0000		=	130	+	(30 × 3)	=	220

Correction of this error will prevent confusion on the part of any one who may use the method.

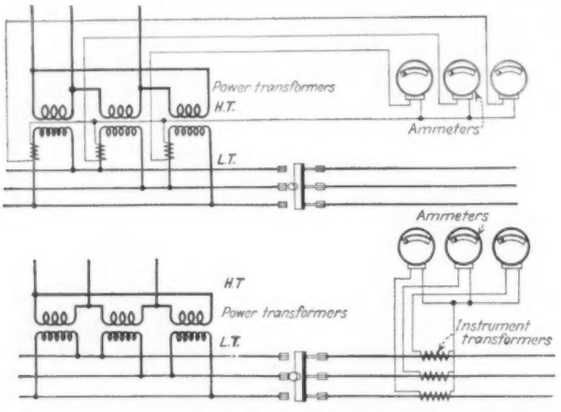
Citizens' Gas & Electric Company, AUSTIN BURT,
Waterloo, Iowa. Manager.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Instrument Transformer Connections Should Have Been Different

A RATHER interesting case of trouble occurred some time ago which would not have gone undetected as long as it did if the instrument transformers had been connected differently. The trouble occurred in a bank



DESIRABLE AND UNDESIRABLE WAYS OF CONNECTING INSTRUMENTS TO TRANSFORMERS

of delta-delta-connected transformers one of which developed an open circuit in the high-tension side. The bank continued to operate in this condition for some time no doubt before being detected. As it happened, the transformers were not operating up to their rating and by running open-delta were quite capable of carrying the load without undue heating. The transformers had ammeters connected in each phase as shown in lower drawing. Had they been connected as shown in upper portion the condition described would have been readily detected as soon as the open-circuited transformer had lost its load. R. H. N. LOCKYER.

Bonnington Falls, B. C.

Rules to Follow When Operating Disconnecting Switches

BECAUSE opening or closing disconnecting switches without taking proper precautions may damage apparatus and cause injury to workmen a set of instructions on the proper method of handling each switch has been issued to operators of the Pennsylvania Water & Power Company. As a guide to operators in other companies the rules are reprinted here:

(a) Switch sticks must be kept in good repair and should be occasionally wiped with a dry rag, particularly on damp days. A place is provided for every switch stick and every switch stick when not in use must be in its place.

(b) Never open or close a disconnecting switch unless the corresponding oil switch is open; that is, never use a disconnecting switch to break or make a power circuit.

(c) Every disconnector has an official designation and every order in connection with disconnector operation must use the official designations.

(d) When an operator orders an assistant operator to operate certain disconnectors, he will simultaneously point to that disconnector on the mimic bus and the assistant operator will repeat the order and throw the mimic disconnector on the board into the half-way position. The operator will verify the assistant operator's repetition and mimic bus indications and if correct say, "Right." The assistant operator will then proceed to execute the order.

(e) An order to open certain disconnectors shall be executed as follows:

1. Go to the corresponding oil switch. Stand in front of it. Read its sign. Make sure that it is the right one. Make sure that it is open.
2. Go to the disconnectors. Stand in front of the middle phase. Read the sign. Make sure that you have the right set of disconnectors. Note the location of the red stripes on the barriers between circuits.
3. Sidestep to the compartment farthest to the left, next to the red stripe. Again make sure that you are on the right circuit.
4. Pull the disconnector. Turn the face when doing so to prevent flashing in the eyes in case through some mistake the disconnector is loaded. Pull each disconnector, from left to right, in the same manner. Stop when you have pulled three switches to the red stripe.

Similar procedure should be used when closing disconnectors. In the case of high-tension switching it is not necessary to go to the oil switch as called for in the first step. The pilot lights on the barriers must be observed in this case.

(f) When the assistant operator has executed his order he will report the same to the operator, specifically mentioning the names of switches he has opened or closed and throwing the mimic disconnectors on the benchboard to the proper position. The operator shall repeat the report and note that the proper mimic disconnectors have been operated.

(g) If one disconnector of a set of three has been opened under load and this is at once noticed, it may be immediately closed again if not badly burned. If two disconnectors have been opened, do not close again.

(h) Do not open bus section disconnectors, even if the ammeters show no flow of current, if the opening of these disconnectors separates two systems which then fall out of phase with each other or if any considerable difference in voltage is created on these two systems, even though they be held in parallel by some other switch. A comparatively small arc caused by this difference in voltage when opening the switch may be sufficient to start a flashover across the buses.

(i) Bus reactor short-circuiting disconnectors should be opened with caution for the same reason. Decrease the current from one section of the bus to the other to a value less than 250 amp. before opening such bus reactor disconnectors.

(j) Before closing any bus section disconnectors be sure that the supposedly clear section of the bus on one side of the switch is really clear and if the disconnector is between two sections carrying load be sure that they are in parallel through some other switch and that there will be no excessive flow of current through this switch when it is closed and also that the switch closes and makes good contact at once, so that whatever interchange of current there may be will not cause an arc which might develop into a flashover.

(k) Disconnecting switches must not be slammed in unnecessarily hard, as doing so cracks the insulating supports.

There should, however, be no hesitation when opening or closing disconnectors. In pulling high-tension disconnectors they should be hooked in such a manner that they do not fall away from the switch hook.

(l) Any signs of disconnector clips or hinges cutting or running hot should be corrected at the earliest opportunity. A piece of paraffin on the end of a switchstick can be used for detecting hot switches.

Pennsylvania Water & Power Co., Baltimore, Md. A. E. BAUHAN, Superintendent of Stations.

Improved Practices Make Cable-Fault Location More Certain

AN EXTENDED description of fault location by the interrupter and telephonic method was published in the ELECTRICAL WORLD of Sept. 11 and 18 and Oct. 9, 1915. Since then this method has become widely popularized and a number of improvements have been made. Of late the vacuum tube has been pressed into service with great success and further refinements in exploring-coil design have been achieved.

A new exploring coil of the sector type has lately been developed to furnish a powerful signal, and this is usable on either single-conductor or multiple-conductor cable. With this type of coil applied to a multiple-conductor cable it is found on going around the sheath that the signal in the telephone is louder in spots. That is, there are "humps" in the field from the current in the faulty conductor in case a ground exists or in the field around the conductors in case there is a short circuit. Where there is considerable return current on the sheath beyond the fault this becomes apparent, because there are no "humps" in the field and the signal due to the sheath is the same all around it. This type of coil, illustrated herewith, gives a louder signal than the earlier forms developed, especially in the case of cement-covered cables.

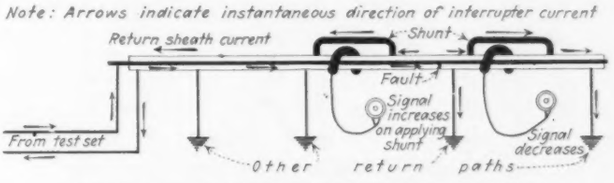
To do away with the need of making so-called test cuts on cable sheaths a shunt is now employed on the sheath of single-conductor cables when testing for faults by the interrupter method. The shunt is used as shown in the accompanying diagram, with an exploring coil between its ends. It consists of a piece of No. 0000 copper bent U-shaped, 10 in. long and 4 in. high. It must make good contact with the sheath. When the shunt contact is made the intensity of the interrupter signal in the

SECTOR TYPE OF EXPLORING COIL FOR LOCATING FAULTS IN CABLES

portable telephone will increase if the burn-out is ahead of the point of application. The intensity will decrease if the fault is behind the point of application. In practice it has been found that, while the increase is not always discernible, the decrease is usually sufficiently marked to permit accurate location. This apparatus is very convenient in locating the exact trouble spot in cables after removing them from the ducts in case the burn-out does not show through the sheath.

The vacuum-tube amplifier has been applied with great advantage to cable-fault location within the past year or so. Equipment is now available for use with the various types of exploring coils provided in fault-locating apparatus, and the quick and accurate location of trouble in both overhead and underground lines has been facilitated. With the amplifier a particular signal can now be heard about three times as far away as before, or a signal of a certain value can be made three times as strong. In hunting trouble on overhead lines this means far less pole climbing and in cable work many less openings of manholes.

In tracing an "open" or a ground overhead it is no longer even necessary to stop the motor of a trouble hunter's automobile. In underground work signals can be heard above ground with the triangle (see previous articles) that could not possibly be heard without the amplifier. About the only kind of faults that give much trouble in practice are burn-outs in fresh water. As



COPPER SHUNT HELPS TO LOCATE CABLE FAULTS BY EXPLORING COIL METHOD

these high-resistance faults are not capable of being carbonized, they do not allow sufficient signaling current to pass through the fault to give a loud indication. While hitherto in multiple-conductor faults it has been possible to neutralize the charging currents, the signal due to the fault current was usually very weak and hard to trace. A new method of handling high-resistance faults, such as those submerged in fresh water, has just been developed. The details of this method are not quite ready for publication at this time. By its use high-resistance faults may be located with the same speed and accuracy as those of low resistance. The amplifier overcomes much of this difficulty. The amplifier is also useful in locating leaky insulators of the pin type.

The filament current of the amplifier tube is supplied by two ordinary flashlamp batteries. In case a 6-volt storage battery is available, it can of course be used instead of the dry cells.

J. F. BEEDLE.
Lundin Electric & Manufacturing Company,
Boston, Mass.

Testing for Phase Sequence in Three-Phase Circuits

IN THE article by H. J. Blakeslee on "Testing for Phase Sequence in Three-Phase Circuits" published in the July 23 issue of the ELECTRICAL WORLD, page 177, the connection diagram fluxes *A* and *B* should be interchanged to correspond to the vector diagrams. Flux *A* in the vector diagram should be the flux in the portion of the core surrounded by the high reactance, and Flux *B* should be in that portion of the core surrounded by the coil of low reactance. The vectors are substantially correct and correspond to the core and coils in the connection diagram and the descriptive matter.

Field Winding Diagram Prevents Mistakes

WHEN the field coils of a motor are taken out of the frame during overhauling or when damaged coils are being replaced it is very important to put them back in the frame properly, with the leads so connected as to give the correct relative polarity. In order to prevent wrong connections and to aid the operating man in connecting the field coils a standard winding diagram should be drawn up. Such a diagram showing a modern commutating-pole series-wound railway motor with four commutating-field coils is shown in the accompanying cut. This diagram should be drawn before any fields are removed. To make sure

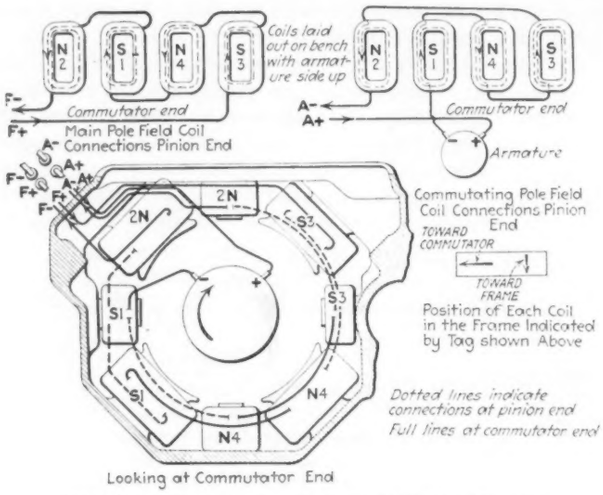


DIAGRAM FOR ASSURING CORRECT CONNECTION AND POSITION OF FIELD COILS

that the coils are put back in the same position a tag such as that shown at the right in the drawing is tied in position on each coil before removal. Then after the coils are replaced a polarity test is made on shunt, series and commutating poles.

While overhauling or repairing field windings the following points are well worth attention:

Coils and frame should be cleaned and painted.

Coils should be placed on poles properly.

Clean the surface of the pole and pole seats, to insure a good close fit when the bolts are drawn up tightly.

Do not pound the pole in place with a sledge; use a block of wood or a piece of soft metal, such as copper.

Be sure that the pole bolts are drawn up tightly and that lock washers are under each nut. Add some white lead over the nuts after tightening to prevent entrance of water.

Sound the assembled poles, using a small hammer, to insure that the poles are drawn up tightly.

Connections should be made as shown on the winding diagram supplied by the manufacturer.

Check the polarity of each coil.

Dip and bake the individual coils. To secure best results, dip and bake the entire frame after the coils are in place and all connections are made.

The motor leads where they come out of the frame should be well protected by insulating bushings.

Where a motor is subjected to much vibration coils should be spring-supported, and, where necessary, backed up by washers of either metal or fibrous material, well painted. In replacing coils, temporarily tape the spring and washers to the coil to keep them from working out of place and getting in between the pole and the pole seat when assembled.

When the coils have terminals the ends of the cable connected to the terminal should have a metal sleeve soldered to the wire, which is held in the terminal by screws securely tightened and locked. It is considered best practice in connection with railway motors to use cables coming out of the body of the coil instead of the heavy brass terminals, to make the wiring around the frame connections. The main objection to the use of terminals is that they are more likely to break off under vibration, or to develop a loose connection and burn off the lead. Another disadvantage is the difficulty of properly insulating the terminals after the connection is made.

The connections between coils with cable leads should be made by butting the ends together, covering the joint by a copper sleeve and soldering well.

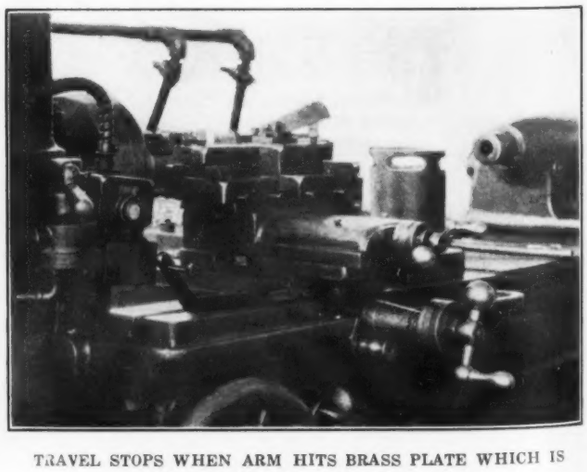
The ends of the cables connected to the brush-holders should be provided with metal sleeves or terminals that are to be securely clamped and locked to the brush-holder casting.

All wiring around the frame should be securely anchored to the frame and tied down, to prevent vibration and to keep the insulation from being rubbed or cut by parts of the rotating armature.

JOHN S. DEAN,
Motor Engineering Department.
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

Adjustable Cut-Off Switch Prevents Over-Run of Lathe

IN A MASSACHUSETTS factory equipped with many motor-driven machine tools it has been found convenient to apply an automatic cut-off switch on certain equipments which can thereby be handled more readily by employees. One of these, illustrated herewith, is an 18-in. Chard lathe driven by a Westinghouse motor with push-button control. In an earlier type the automatic cut-off to prevent the tool from traveling too far toward the lathe axis was secured by attaching a ¼-in. iron rod to the movable tool base and fitting the end of this rod with a set screw which would depress the stop button when the end of the travel was reached. A more satisfactory arrangement is the one shown, in which the stop button is covered by a thin piece of brass plate bent at right angles to the button box and sufficiently flexible to actuate the stop button when pushed inward



TRAVEL STOPS WHEN ARM HITS BRASS PLATE WHICH IS RESTING AGAINST PUSH BUTTON

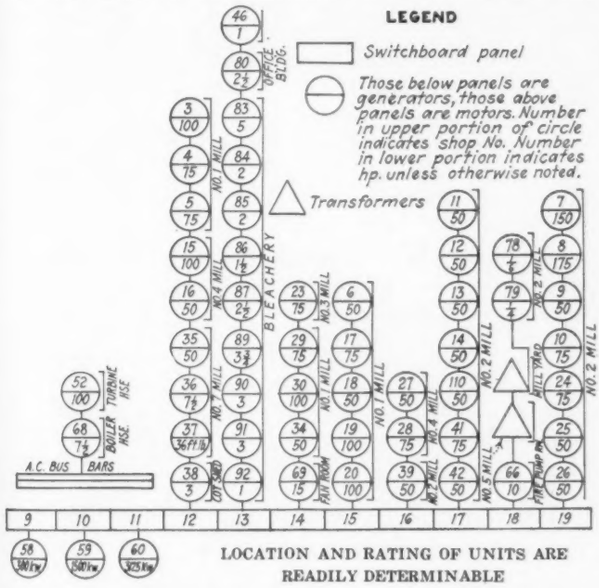
by mechanical contact. This contact is provided by a bolt threaded into an arm carried in front of the stop button plate and attached by screws to the movable tool base. The arm, which is bent at an angle of about 60 deg. from the horizontal at a distance of about 10 in. from the tool base support, is an ordinary piece of bar

iron about ⅜ in. thick. With this arm a better adjustment is obtained than in the earlier arrangement, with corresponding increase in accuracy of motor cut-off as the cutting tool feeds in.

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Chart Indicates Location and Rating of Each Unit

IN MANY industrial plants which generate their own power, and also in plants which distribute central-station power through a main switchboard, a graphical representation of the numerous power circuits is often-


LEGEND
Switchboard panel
Those below panels are generators, those above panels are motors. Number in upper portion of circle indicates shop No. Number in lower portion indicates hp. unless otherwise noted.
Transformers
A.C. BUS BARS
LOCATION AND RATING OF UNITS ARE READILY DETERMINABLE

times of considerable value to the attendant in determining the number of motors which are connected to a certain panel of the switchboard and their size and location.

To meet this requirement the writer has devised a chart (part of which is illustrated herewith) which has proved its value in a number of instances. In this case oblongs have been used to represent the various panels of the switchboard, an oil switch being mounted on each panel to control the feeder circuit. Current is generated at 440 volts for power service and is stepped down to 110 volts for lighting.

Circles have been used to denote electrical machinery, those below the switchboard representing generating machinery, while those above represent motors. Transformers are indicated by triangles and motors operating at 110 volts are shown connected to the transformers. The circles are divided into halves by a horizontal line; the numbers appearing in the upper portion indicating the "shop" number, while those in the lower portion indicate horsepower unless otherwise noted.

The chart has been made self-explanatory as far as possible and clearly shows the number of motors connected to each feeder circuit, together with their horsepower, shop number and location.

The original tracing is kept on file, and when new motor installations are completed, they are drawn in on the tracing and new blueprints are made, thus keeping the chart up to date. LEROY A. FRANCIS,

Utica Steam Cotton Mills, Chief Electrician.

Utica, N. Y.

Accidents Avoided Through Knowledge and Obeying Rules

DISSEMINATION of knowledge is the first important step in the work of reducing electrical hazards, and practice of the moral obligation to comply strictly with known requirements is the most important step. As an example it may be pointed out that since bad results do not always follow overfusing or blocking circuit breakers to permit of carrying overloads, this encourages many operators who do not understand the hazard involved to indulge in these bad practices in disregard of instructions. The contact points of blades of operating controllers can be made to stick whether or not distant control is employed, and damage frequently results before the circuit can be broken by any other means that have been provided. Could operators realize that overfusing or blocking circuit breakers is the same in effect as rendering inoperative a safety valve or an open throttle valve on an engine, the practice would not be followed. The damage it can do is limited in extent only by the other protection, if any is provided, for the branch system, and sometimes the damage extends back to the generators, with consequent opportunity for accidents.

Because switch blades or control contacts can be made to stick by overheating, none should be so arranged that they cannot be made visible for inspection while the current is on.

Overloading equipment is probably responsible for as many accidents as any other single cause. It results in breakage that may be immediately followed by injury to persons, or an impairment that later results in breakage. Overloading sometimes results through the ignorance of persons authorized to decide what a piece of equipment shall do, regardless of protests that may be made by operators or other employees connected with the work of caring for and maintaining it.

While none would attempt to minimize the importance of insulation, the limits imposed by lack of capital must be recognized. However, this should not abate the insistence of demand for it. A rather common kind of accident is for a person on a metal structure to touch a high-tension wire and thus intercept the current. If a structure were so perfectly insulated that current could not go through it to ground, no injury would result from contact with a conductor while on the structure. Persons may frequently have been in contact with dead metallic parts and current-carrying parts without receiving injury, and this leads them to ignore the principle, if they have ever understood it, that if such metallic parts are grounded they will complete a path through which current can travel to ground. Assuming that the structures or metal parts are not grounded and that contact is made between them and current-carrying parts, then also a person brought in contact with the structure would complete a path to ground. Therefore it is best practice to make electrical grounds to all dead parts.

Maintenance of equipment in a proper condition is largely the responsibility of inspectors. Breakage of parts weakened by wear and failure to keep parts properly keyed, bolted and lubricated have been responsible for many accidents. Lack of ruggedness in equipment is responsible for many accidents as breakage occurs when haste and unusual exposure to hazard must follow in order to prevent loss and sometimes disaster. It is

difficult to control the handling of equipment so perfectly that unusual and excessive stress will not be put on it, and such excessive stress many times impairs the parts that necessarily are delicate but can fail only because of failure of more rugged parts caused by abuse. In many cases the matter of locating and repairing failure of delicate parts exposes some one to high hazard.

Standardization of parts of equipment and of the methods that should be followed in construction is important because it includes ruggedness, which lessens breakage; interchangeability and easy access, which shorten delays, lessening the number of men exposed and the length of time of exposure to hazard; simplicity of operation, which lessens the strain on the minds of operators with resulting failure to observe and act with promptness, and uniformity of arrangements; as an instance, arrangement of controllers so that operators changed from one piece of equipment to a similar one will not be liable through habit to operate the wrong controller.

Abuse of equipment is responsible for a high hazard. Machinery cannot be so ruggedly constructed that abuse will not impair it, and inspection cannot be so closely followed that parts weakened by abuse will not fail at a time when the results may be serious.

Operation of equipment by persons not authorized or qualified is dangerous. If not authorized, they may endanger some one through lack of information as to surrounding conditions. If not qualified, they may be the cause of an accident because they do not know that control of an apparatus is sometimes dependent on other factors than operating controllers, as, for instance, filling an air tank to operate brakes. They may be ignorant of operating requirements and may fail to do any of the many things that should be done to avoid accident.

Failure of employees to co-operate is responsible for many accidents. This particularly applies to operators, inspectors, repairmen and others who should notify one another of their intended actions in order that one may not endanger another.

This information was embodied in a talk by Walter Greenwood, safety engineer Carnegie Steel Company, at a meeting this week of the Metals Section of the National Safety Council, Boston, Mass.

Simple Multipliers for Measuring Current with a Millivoltmeter

IT IS OFTEN desired to measure the current in a circuit which for some reason or other it is impossible or inconvenient to open to permit of the insertion on an ammeter. In such a case it is the usual custom to measure the drop of potential along a certain measured distance on the wire or cable with a millivoltmeter and then, knowing the cross-section of the wire and therefore its resistance per foot and the drop between the voltmeter contacts, to estimate the current flowing in the wire by the use of Ohm's law. However, the contacts are often driven or screwed into the wire before the distance between them is measured, or else some arbitrary distance is taken. The result is that considerable calculation is necessary before the correct amount of current can be arrived at. A much simpler way is to place the contacts at fixed distances apart, these distances being chosen so that the millivoltmeter readings can be multiplied by some constant which will quickly and easily give the answer. As the most convenient distance apart for attaching the contacts will generally be found to be between 5 ft. and 10 ft., the accompanying table has been made with the idea of using easy multipliers for the voltmeter readings when the contacts are placed between those limits.

LENGTHS OF CONDUCTOR THAT GIVE SIMPLE MULTIPLIER FOR MILLIVOLT READINGS WHEN MEASURING CURRENT

When millivolt reading is multiplied by the constant, the result is amperes. The values are for standard annealed copper at 70 deg. Fahr.

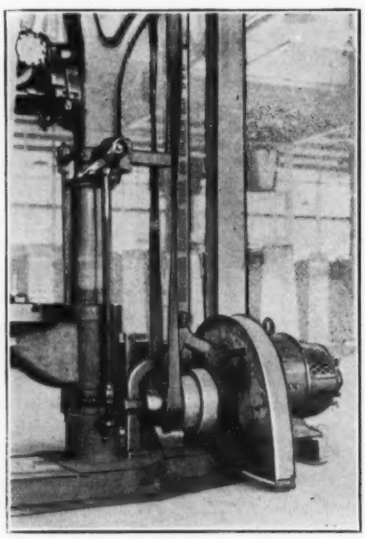
Size of Wire (Circ. mils or B.W.G.)	Constant	Distance Apart of Contacts (Ft. and In.)
1,000,000	10.0	9 6½
950,000	10.0	9 0½
900,000	10.0	8 6½
850,000	10.0	8 1
800,000	10.0	7 7½
750,000	10.0	7 1½
700,000	10.0	6 8
650,000	10.0	6 2
600,000	10.0	5 8½
550,000	10.0	5 3
500,000	5.0	9 6½
450,000	5.0	8 6½
400,000	5.0	7 7½
350,000	5.0	6 8
300,000	5.0	5 8½
250,000	2.5	9 6½
0,000	2.5	8 1
000	2.5	6 5
00	2.5	5 1
0	1.0	10 0½
1	1.0	7 11½
2	1.0	6 4
3	0.5	10 0
4	0.5	7 11

The contacts are placed between those limits.

Brooklyn Rapid Transit Co., Brooklyn, N. Y. — G. H. MCKELWAY, Engineer of Distribution.

Individual Motor Drive Adapted to a Column Drill

AN EXAMPLE of a changeover from group drive to individual drive of a Superior column drill is shown in the accompanying photograph, which was taken in a Massachusetts industrial plant. This installation demonstrates the ease with which a motor can be placed at the proper height above the floor when the main driving pulley is near the machine base. A variable-speed direct-current motor (740 to 220 r.p.m.) is used, in this case with a gear drive, the motor being mounted upon 4-in. I-beams. Push-button control with solenoid-type switches is provided. The design of the drill frame with the open space about it made it inconvenient to mount the motor directly on the frame. Therefore, it was mounted on the I-beams which rest on the floor. Some floor space was sacrificed by the motor mounting and the gear guard, but they are located on the side of the machine away from the working table.



MOTOR MOUNTED ON I-BEAM ON FLOOR

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Industrial Information Spread Nationally by Georgia Railway & Power Company

THE Georgia Railway & Power Company has recently inaugurated a service of industrial information which is being sent out periodically by the company's publicity department to about 800 of the larger Northern and Western newspapers and other interested agencies. Each month an industrial and agricultural survey of Georgia is prepared by this department setting forth the industrial and agricultural conditions and business outlook in the state. The information is gathered from all available and reliable sources and is then condensed and published in a four-page digest. The company believes that this kind of news about Georgia is of sufficient general interest to attract the editors throughout the country and lead to considerable widely distributed newspaper comment that cannot but be beneficial to the state.

In the industrial letter of Sept. 13, for instance, some intimate facts are given as to the effect on the planters of the recent spectacular rise in the price of cotton and the reaction on the retail shops and banks. Figures and facts are given on results from the Georgia peach and watermelon crops, with a word about construction and general business activities. It is a brief, newsy, readable communication that is sure to spread confidence in Georgia and contribute an impulse to the industrial activity of the state.

Utica (N. Y.) Gas & Electric Company to "Service" Domestic Refrigerators

THE Utica (N. Y.) Gas & Electric Company has adopted an interesting plan by agreeing with local domestic refrigerator dealers to send electric service men to the refrigerator factories to train for "servicing" domestic refrigerators. All complaints or trouble calls concerning refrigerators will be handled by the Utica Gas & Electric Company, and its men who have qualified along refrigerating lines will take care of all service and inspection on these machines in the same way that the usual trouble calls regarding electrical appliances are handled. The refrigerator dealers have agreed to carry the necessary repair parts in their stock and to pay to the electric company one-half of the actual expense of labor for "servicing" these machines.

This plan gives the consumer ample assurance when he buys a domestic refrigerator of reputable make that the central-station company stands ready twenty-four hours each day to give the same attention to the electrically driven refrigerator as it would to the washing machine, flatiron, vacuum cleaner or any other electrical appliance.

The company is conducting tests on various types of household refrigerating machines. Data are obtained relative to energy consumption, load curve, water consumption, sustained temperatures of room, brine compartment, storage compartment and rise in circulating water, pressures of refrigerant, ice-making capacity and total cost of operation. As a result of these tests the company can determine for itself what machines it can recommend to its customers, its indorsement being based upon economical operation and efficiency for the customer, desirability of load and the probable requirements of service on the part of the company.

The domestic refrigerator will demand some attention, and the plan adopted by the Utica Gas & Electric Company seems to fulfill all service requirements until the refrigerating companies shall have sold a sufficient number of machines in one locality to justify establishing their own service stations.

A Standardized Equipment for the Tea Wagon Developed in Boston

SOME interesting experiments in the wiring of tea wagons have resulted in the adoption of a standard equipment by the appliance department of the Boston Edison Company. C. E. Greenwood, the department superintendent, says: "The tea table which we have fitted up has the extension cord permanently attached, the cord entering a long metal box containing the equipment. We had a special long plate made, the width of the framework under the table top, containing two double-T receptacles, with a push-button switch and a pilot light between the two receptacles. The 25-ft. cord is No. 14 heater cord. This is bulky, but it can be folded compactly and hung neatly on a small hook underneath the table top. We are working on the development of a self-contained unit that can be applied to the different

THE BOSTON WIRED TEA WAGON WITH ITS STANDARD EQUIPMENT

pieces of furniture that should be wired and the question arises whether it would be best to have the cord permanently attached to the tea table or separable. We are arranging to have prongs extending from the outlet box so that the extension cord can be made in any length with a split plug on one end and a female plug on the other. The cord can then be detached from the table while still connected to the baseboard receptacle with no possibility of any one getting a shock from exposed terminals of the plug."

Population Increases 15 per Cent, Electric Customers 250 per Cent

AN INTERESTING comparison can be made from the recent census figures which show that the population of the United States increased slightly less than 15 per cent in the ten years 1910 to 1920. In the same ten-year period the number of customers of electric light and power companies increased more than 250 per cent and the amount of electrical energy sold increased over 350 per cent. The expansion was not confined to any particular section of the country, but was distributed about equally throughout all parts of the United States.

Business Men of All Communities Served Meet to Consider Utility Financing

ABOUT fifty leading citizens of Charleston, W. Va., and a dozen or more other smaller communities served by the Virginia-Western Power Company gathered recently at White Sulphur Springs to attend a meeting called to consider the general subject of utility financing. The fact that these men were selected on invitation as representing the most prominent banks, newspapers and business interests of these Virginia and West Virginia border-line towns made it a notable gathering. For it expressed an active feeling of responsibility on the part of the leading business men of the territory served by the power company in the welfare of the utility on which they all depend for a vital service.

The party was entertained at luncheon as guests of General Manager A. H. Grimsby, and a meeting followed at which W. T. Dabney, business manager of the Richmond Chamber of Commerce, spoke on "Community Co-operation and the Importance of Supporting Local Utilities," Judge G. R. C. Wiles of the West Virginia Utility Commission on "The Advantages and Advisability of Financing Utilities Locally," A. Bliss McCrum, secretary of the Public Utilities Association of West Virginia, on "Eliminating Utility Securities from the Speculative Class by Commission Regulation of Rates," and M. H. Aylesworth, executive manager of the National Electric Light Association, on "Taking Our Customers Into Partnership." This meeting was followed by golf and motoring and then by a dinner at which there was a free general discussion of the broad subject of customer ownership of utility securities. The deepest interest was shown and a thorough recognition that every business man is directly concerned in the prosperity and protection of the local electric company. Resolutions were passed and published in the newspapers throughout the different communities indorsing the plans of the power company for the sale of securities direct to the consumer.

What Other Companies Are Doing

San Francisco, Cal.—So much interest has been shown throughout the country in California's electrical homes that the California Electrical Co-operative Campaign, 710 Humboldt Bank Building, San Francisco, has prepared a complete booklet explaining and summarizing the purposes, organization and results of its work along these lines. The booklet is liberally illustrated with exterior and interior views of each home, with samples of the newspaper stories published and the advertising done, with sample folders and announcements distributed, and with wiring plans.

Salt Lake City, Utah.—The Utah Power & Light Company has engaged the services of Mrs. Louise Palmer Weber, a lecturer on home economics and dietetics, for a series of ten free lectures, for the benefit of the housewives. These began on Sept. 9 at the Commercial Club in Salt Lake City and are to be held every Tuesday and Friday afternoon for a period of five weeks from that date. Mrs. Weber will conduct a campaign of education, not only in the use of electricity for cooking, but also in furnishing expert advice and instruction on home economics.

Dallas, Tex.—The Texas Power & Light Company has issued and is distributing to its customers and the public an interesting booklet entitled "My Business, Your Business and Our Business." It is intended to answer the questions commonly asked regarding the public utilities. Some of the items discussed are the functions of the utilities, relationship to community and national prosperity, investment in utility services, rates for service—how fixed, watered stock an impossibility, state commission regulation, constitutional protection of utilities, and the future of public service.

Pittsfield, Mass.—To celebrate the installation of a new 5,000-kw. steam turbine unit at its Silver Lake Station, the Pittsfield Electric Company recently invited its stockholders to hold their annual meeting, with a dinner, at the plant. About 100 stockholders accepted the invitation and were taken to the station in autobuses. Guides showed the party about the station upon arrival. Long tables decorated with flowers were placed in available spaces in the electrical bay on the turbine-room floor and a full "shore dinner" was served. The chief engineer of the station officiated as cook, superheated steam from the company's 520-hp. boilers doing the cooking. Young women employees from the company's offices served as waitresses.

New York.—Sales of household electrical appliances have increased from 100 to about 155 per cent between 1914 and 1921, according to John F. Kelly, manager of showroom sales for the New York Edison Company. Records of sales for the months of June and July, 1921, are 8 per cent and 33 per cent above those for the corresponding periods of 1920. During May, 1914, household appliances disposed of totaled 916 articles, compared with 1,564 for the same month in 1921. In July, 1914, sales were 641, against 1,643 pieces for the same month this year, showing that within the past seven years a steady increase in sales took place. Mr. Kelly asserted that when the fiscal year of 1921 is over he expects business will be from 25 to 50 per cent better than that of last year.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
of the World

Generators, Motors and Transformers

Automatic Brush-Shifting Motor for Driving Draft Fan.—R. A. JONES.—This article describes the forced-draft fan equipment recently put into operation at the Springdale station of the West Penn Power Company, which includes a comparatively new type of polyphase alternating-current, variable-speed, brush-shifting motor, designed to eliminate the objectionable poor efficiency and limited number of speed points inherent with slip-ring induction motors. The induced-draft fan equipment for each boiler consists of two centrifugal fans coupled together and driven from one end through a flexible coupling by a 175-hp., 514-r.p.m., 2,200-volt, three-phase, 60-cycle slip-ring induction motor and from the other end through a magnetic clutch by a 400-hp., 720-r.p.m. slip-ring motor. Secondary resistance is provided to give a speed range from 514 to 450 r.p.m. with the larger motor and from 450 to 255 r.p.m. with the smaller motor.—*General Electric Review*, September, 1921.

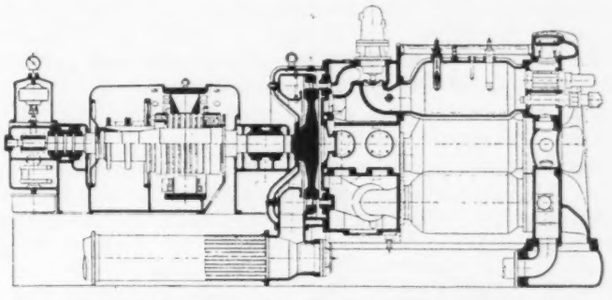
Variable-Speed Induction-Motor Sets.—C. W. KINCAID.—A description of obtaining variable speed in induction motors by several methods, among which are the Kramer system, the Scherbius system and the frequency converter system. A fuller description of the last method is given.—*Electrical Journal*, September, 1921.

Lamps and Lighting

Industrial Lighting with Mercury-Vapor Lamps.—E. L. ELLIOTT.—This paper gives the characteristics of the light suitable for the successful illumination of industrial plants and describes installations of mercury-vapor lamps used in automobile factories and for similar service. Higher lighting standards are advocated.—*Electrical Review*, Sept. 10, 1921.

Generation, Transmission and Distribution

The Gas and Oil Turbine.—W. SCHÜLE.—Much has been written, innumerable patents have been granted, and several books have been published on the subject of gas turbines during the last ten years. Yet there is nowhere a gas turbine in actual use. A French designer, Armengand-Lemale, went further than all his contemporaries and actually built a gas turbine, but it proved a failure. The Thyssen Works (Mülheim) succeeded finally, after years of research work, in developing the Holzwarth patents into a very serviceable machine, operating either with gas or with fuel oil. Their first gas turbine was used in 1913, and ever since then the development of this new type of prime mover has been pushed vigorously, until today a 10,000-kw., 1,500-r.p.m. machine gives results thermally superior to those obtained with an up-to-date steam turbine. Some of the greatest difficulties in the design of a gas turbine are (1) the very high temperature of the burning gas mixture which drives the turbine wheel or wheels (1,500 deg. to 2,000 deg. C.), (2) the choice of a turbine-wheel material withstanding this high temperature, and (3) the proper cooling of the explosion chambers. The author proves by actual test and operating results that all these problems have been solved and that the gas or the oil turbine represents today a serious competitor with the steam turbine for either stationary, railway or ship propulsion purposes. The article contains a number of drawings and photographs of gas turbines of from 500 kw. to 10,000 kw. output actually built and in operation. Contrary to steam turbine practice, only two stationary and one running bucket wheel are used. The exhaust heats a small steam boiler, which furnishes steam for the steam-turbine drive of auxiliary machines, such as an air blower for the main turbines. The experimental gas turbine first built was arranged with a vertical shaft, but further experience proved that a horizontal shaft is preferable. Some test data of the 500-kw. oil turbine



SECTION THROUGH A 500-HP. OIL TURBO-GENERATOR

will be of interest: The speed attained was 2,700 r.p.m. There were six explosion chambers operating fifty to sixty times per minute each. Owing to the speed with which the burning oil-gas mixture is blown out through the runner (0.1 second) and the consequent inrush of fresh air to the explosion chamber, the average temperature in the chambers is only about 470 deg. C. Only about 9 per cent of the combustion heat is lost in the cooling water of the cast-steel explosion chambers, the walls of which are 15 mm. thick.—*Elektrotechnische Zeitschrift*, July 21 and 28, 1921.

Vector Processes for the Calculation of Electrical Networks.—M. MUSYCK.—First part of a paper devoted to the calculation of currents and voltages in electrical networks, the author basing his method upon the representation of current intensities by vectors. "The introduction of the vector," he says, "in a problem involving continuous currents has no correspondence to the well-known employment of the same geometrical element for the study of alternating currents. When in the latter case there are properties pertaining to sinusoidal functions which render the adaptation of the vector possible, its employment is justified by considerations based simply on Ohm's law. To an addition of electric currents one can make a geometrical addition of vectors to correspond. This principle established, there can be developed without difficulty a method permitting easy solution of the problems of

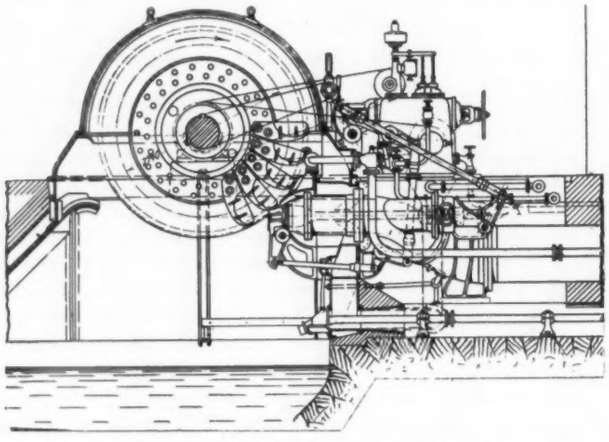
electrical networks."—*Bulletin de l'Association des Ingénieurs Electriciens sortis de Institut Electrotechnique Montefiore*, July-August, 1921.

Traction

Study of Pantagraphs and Overhead-Line Construction of Electric Main Roads.—P. LE BOUCHER.—The author gives first a theoretical study of the most desirable properties of a pantagraph current collector, such as (1) steady pressure, irrespective of height of wire; (2) great lateral steadiness; (3) small air resistance, and (4) small inertia, so as to follow easily any change in height of the overhead wire. About sixty different pantagraph constructions have been tested by the author, and the results are given in tabulations and curves. While it is American practice to maintain an average pressure of 11 kg. per square centimeter of the pantagraph against the wire, French railways use only 4 kg. to 8 kg. per square centimeter. The second part of the paper describes a number of catenary wire suspension systems, as used in Europe and in America. Several pages contain valuable construction details with exact drawings of overhead constructions of French 12,000-volt alternating-current lines.—*Revue Générale de l'Electricité*, Aug. 6, 13 and 20, 1921.

Installations, Systems and Appliances

The Hydro-Electric Plant on the Glomfjord.—G. TROELTSCH.—Situated 20 miles beyond the Arctic Circle on the Glomfjord, in Norway, a water-driven power plant of more than 75,000 hp. has recently been finished which supplies energy for metallurgical purposes. Two, and later three, steel pipes, 2,000 mm. down to 1,400 mm. in diameter, carry each 5.72 cu.m. of water per second to the power house under a useful head of 442 m. The station contains two 25,000-hp. and one 27,500-hp. turbine, with room for one more of the latter



ELEVATION AND PLAN OF HYDRO-ELECTRIC PLANT IN ARCTIC CIRCLE

capacity. The article deals only with the hydraulic part of the plant, describing in particular the design of the waterwheels, which are adapted for the largest turbines used in Europe, built by J. M. Voith. The turbines are of the double-runner Pelton type, each runner being actuated by a single jet of water 260 mm. in diameter. The wheels have a diameter of 3.4 m. and are equipped with twenty-two buckets each. Of special interest is the novel double-action regulator, which actuates the customary needle in each nozzle and also a jet deflector. In case of a sudden decrease of the load the regulator first partly deflects the jets, then advances the needles, and after the jets have been thus adjusted to the proper volume the deflectors are swung back again, resulting in a great economy of water. The regulator is driven by a belt from the main shaft. If, for some reason, the belt should break or slip off the pulley, a small auxiliary Pelton turbine is automatically started up to maintain the drive of the regulator. Another novel feature is a hydraulic brake on the wheels, enabling the operator to stop the turbine quickly. This consists of two small water jets which can be directed against the backs of the buckets. Tests on the turbines in place showed a highest efficiency of 88.2 per cent. A sudden decrease of the load from 27,500 hp. to 4,500 hp. caused an increase in speed of only 8.8 per cent.—*Zeitschrift des Vereines Deutscher Ingenieure*, July 2, 1921.

Electrochemistry and Batteries

Regeneration of Manganese-Dioxide Dry-Battery Electrodes.—A method of reclaiming the electrodes of dry cells instead of discarding them. Experiments tend to show that the cleaning of the electrodes and the removing of the deposits clogging the pores of the bag and of the depolarizer are more important than the actual reoxidation of the maganese. This is fortunate, for the reoxidation cannot be effected by the simple chemical means.—London *Engineering*, Sept. 2, 1921.

Electrophysics and Magnetism

The Magnetic Electron.—ARTHUR H. COMPTON.—The author reviews the different lines of evidence from which information concerning the nature of the elementary magnet has been gained. He concludes that the electron itself, spinning like a tiny gyroscope, is probably the ultimate magnetic particle.—*Journal Franklin Institute*, August, 1921.

Units, Measurements and Instruments

Innovations in Electric Measuring Instruments.—G. KEINATH.—As a consequence of the present large increase in cost of all electrical apparatus a great number of very poorly built measuring instruments were thrown on the German market, which forced the German electrotechnical association to establish certain standards of accuracy and to designate visibly every instrument which met these requirements. The author describes in detail the latest designs of short-circuit-proof current transformers up to 100,000 amp., high-frequency ammeters as used in radio work of the iron type, and the hot-wire-type electrostatic voltmeters with compressed nitrogen insulation and with series air condensers, multiple-phase wattmeters, frequency meters, instruments with two movements to register the relation between two variables, and finally instruments for remote indication and registration of pressure temperature and the flow of gases.—*Elektrotechnische Zeitschrift*, Aug. 18, 1921.

Telegraphy, Telephony and Signals

A High-Frequency Machine of Greater Specific Power and Higher Efficiency.—MARIUS LATOUR.—A machine marketed by the Société Française Radio-Electrique is described which is a homoplar machine with a reduced number of stator slots. In the case of this machine it is possible to minimize the iron losses in the stator by not utilizing entirely the available space for the copper and by increasing the cross-section of the teeth at the bottom of the slots in such a manner as to decrease the magnetic induction.—*Radio Review*, August, 1921.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Co-operative Study of California Water Powers May Be Made

IF A SATISFACTORY arrangement can be made, the Federal Power Commission will co-operate with California in the study of the water-power resources of that state. The executive secretary was authorized to expend $15,000 to cover the expenses of the Federal Power Commission's participation in this work. The State of California has appropriated $200,000 for the study.

Unemployment Conference Under Way This Week

THE "unemployment conference" called by President Harding got under way in Washington on Monday. The meeting, which was under the direction of Secretary Hoover, was told by the President that he had little enthusiasm for any proposed relief in the way of charity from the national treasury. The conference rather is to seek the causes of lack of employment and suggest some constructive means whereby it can be lessened.

Secretary Hoover stated that the questions before the conference fell under the following broad phases:

A determination of the volume and distribution of non-employment.

A determination of what emergency measures should be undertaken to provide employment and to mitigate the suffering that may arise during the next winter and the method of organization for their application.

A consideration and a statement of what measures must be taken to restore our commerce and employment to normal, or, to put it in another way, what obstacles need to be removed to promote business recovery.

In opening the conference President Harding was most optimistic over the outcome, saying:

"There are no problems affecting our national life and the welfare of the American people which we cannot and will not solve. If we fail today, we will try again tomorrow. There has been vast unemployment before and will be again. There will be depression after inflation, just as surely as the tides ebb and flow, but we can mitigate, we can shorten duration, we can commit all America to relief, and all America has never failed when committed to a common cause. If out of your councils there comes a remedy which all America helpfully may apply today, it may be helpfully employed some time again when similar conditions are encountered.

"It is fair to say that you are not asked to solve the long controverted problems of our special system. We have builded the America of today on the fundamentals of economic, industrial and political life which made us what we are, and the temple requires no remaking now. We are incontestably sound. We are constitutionally strong. We are merely depressed after the fever, and we want to know the way to speediest and dependable convalescence. When we know the way, everybody in America, capital and labor, employer and employee, captains of industry and the privates in the trenches, will go over the top in the advance drive of peace. Frankly, it is difficult to know whether we have reached that bedrock to which reaction runs before the upward course begins, but here are representatives of the forces which make for all we are or ever can be, and your soundings ought to be reliable.

"I would have little enthusiasm for any proposed relief which seeks either palliation or tonic from the public treasury. The excess of stimulation from that source is to be reckoned a cause of trouble rather than a source of cure. We should achieve but little in a remedial way if we continued to excite a contributing cause."

The initial efforts of the conference were directed to meeting emergency needs of the employment situation, after which were to come recommendations for permanent measures for holding non-employment at a minimum. The sechedule called for public hearings throughout the week.

Pacific Coast Division of N. E. L. A. to Change Name

A GENERAL meeting of the Pacific Coast Division of the National Electric Light Association is to be held in November to consider a change in the name of the division. It is proposed that the new name be "Pacific Coast Electrical Association." It is not the intention to change the present relations of the section with the national organization, but merely to use a name which, it is said, will be more indicative of the character of the division and less cumbersome. Other matters affecting the general scope of the division are also to be decided at the forthcoming meeting, which is to be held in Del Monte, Cal.

Hearing on Accounting Rules Before Federal Power Commission

THE Federal Power Commission gives notice that on Monday, Oct. 17, at 10 a.m., a hearing will be held in room 2220, Interior Building, Eighteenth and F Streets, N. W., Washington, before O. C. Merrill, executive secretary, on the adoption of rules and regulations for the establishment and maintenance of a system of accounts for licensees under the federal water-power act. A tentative draft of proposed accounting rules and regulations was printed and circulated, for purposes of discussion only, under date of June 7, 1921. Any one desiring to offer criticisms or suggestions concerning the proposals contained in this draft or to make a statement or argument with respect to the matters to be considered at the hearing will be given an opportunity to be heard.

Great Lakes Section Discusses the Electric Range

THE effect of the electric range on the investment in service facilities was inquired into during the discussions at the convention of the Great Lakes Section of the National Electric Light Association at French Lick Springs, Ind., last week from the standpoint of the plant and distribution-line equipment as separate units. This is because it was recognized that the problem presented by a plant having its maximum load during the hours of the day when lighting is necessary and the one presented by the plant with a maximum load during the daylight hours because of industrial operations is decidedly different. The discussion brought out that it is necessary to analyze the situation in any given case and consider the effect on the two parts of the system before a correct conclusion as to the cost of service and proper rates can be arrived at. Although station capacities may be increased owing to the imposition of the cooking and appliance loads on the peak, the residential distribution system is less frequently affected. The discussion also laid emphasis on the tendency observable in the station-load curves of so many stations to reflect the effect of washing and ironing in the development of a marked peak in the residential load on Tuesdays, with a gradual fall in the magnitude of the peak during the following days until the arrival of the next Tuesday.

That investment in the training of employees of public utilities for public service must not be considered as an expense was the view of Fred R. Jenkins in discussing the training of employees. It is a necessary part of the business and must have the unqualified support of the executives.

CLASS LEGISLATION DENOUNCED

George M. Barnard of the Public Utilities Commission of Indiana on Thursday morning spoke on "Public Service," strongly denouncing the tendencies toward class legislation that have been displayed in legislative bodies and asserting that government will always be just what the people make it. A strong plea for every man to do his duty in public affairs was made. The poor policy of going before a commission without first going before the public interested and trying to obtain approval of policies it is desired to inaugurate was dwelt on by Martin J. Insull in discussing the public relations work of the N. E. L. A.

The Consumers' Power Company in Michigan as a pioneer in the development of high-voltage transmission was the theme of H. J. Burton, who gave the date of the first use of 110 kv. on that system as 1907 and said the construction of the present 140-kv. system began in 1910, the lines at that voltage being put in operation in 1912. At present the company has in operation more than 1,300 miles of high-voltage lines, of which 526 miles is operated at 140 kv. The system is divided into two parts, the western part being operated at 30 cycles and the eastern at 60 cycles. The system extends from a point north of Saginaw Bay on the east to Manistee on the west, the form being that of a U with the southern limits at Jackson and Kalamazoo. The two parts are tied together through a 15,000-kva. frequency changer at the Battle Creek plant.

J. M. Gilchrist called attention to the need of watching the water powers of the Middle West to prevent their falling into the hands of visionaries and "blue sky artists." Such sites as are possible of development should be developed with a view to including them in the existing systems, and all the existing systems should be developed with a view to an ultimate scheme of tying the systems together with the least loss of investment and the least cost of reconstruction necessary to make them effective parts of the combined system.

F. A. Bryan pointed to the danger that exists from public overconfidence in the use of water power to reduce the cost of service, pointing to cases in which promoters have been able to sell large amounts of securities on projects that cannot be developed at all. E. J. Condon cited one instance in which $175,000 in worthless securities had been sold to the farmers and other local people on a proposition that was not worth development. Misleading ideas as to the cost of developing water-power projects also received attention and were cited as the cause of financial embarrassment to the utilities that had undertaken their development in the belief that they were commercially feasible, only to find that they cost more than it is possible to earn on them.

MAIL ORDER METHOD FAVORED

Mail-order methods rather than the methods of the investment banker were favored by F. H. Scheel in the sale of securities to customers. This is because the data on financial affairs that appeal to the customer of the investment banker are not understood by the man to whom the salesman handling utility securities in small lots makes his sales. The methods adopted must be based more on human interest than on purely financial appeal. The talk and discussion on customer ownership included a strong warning against the sale of any securities that were in any way subject to doubt. Mr. Scheel said that there had been no difficulties encountered with the partial-payment plan despite the presence on the books of the Insull properties, which he represents, of nearly 45,000 such accounts. Steps toward making the junior securities of utilities the most popular form of securities were urged, and the possibility of using these sales as a means of bridging the gap between the first-mortgage securities that can be taken down and the cost of construction was shown by J. M. Gilchrist and also by President Bump of the National Electric Light Association.

W. J. Canada outlined the progress in the inductive-interference work of the National Electric Light Association, and R. F. Schuchardt described the work and organization of the technical section.

President Bump and Executive Manager Aylesworth of the National Electric Light Association were the principal speakers at the annual banquet on Friday evening. President Bump pointed out the present strong position of the central-station companies in that they are undeveloped while other industries as a whole are overdeveloped. He spoke against the optimism that leads to "playing safe" at the expense of future development as a policy that will prevent meeting and solving the future problems of the industry as they must be solved if other industries progress as they should. The electrical industry was viewed by Mr. Bump as the key industry of the industrial world that must lead because it is so placed that it is capable of guiding the others.

Probabilities of Permanent Tariff Waning

THERE is every indication that the federal administration is rather lukewarm toward the enactment of a permanent tariff this year. In official circles the opinion is freely expressed that conditions throughout the world are too chaotic to make it possible to foretell exactly what is needed. The basic condition on which a tariff is built—cost of manufacturing elsewhere as compared with manufacturing costs in this country—fluctuates because of exchange conditions, and little can be foretold as to the future. Therefore it is held that no dependable and permanent tariff can be built on such an unstable foundation.

With reference to the American valuation plan, against which opposition has developed, the administration is moving cautiously. The sum of $100,000 has been appropriated to investigate this device and otherwise determine what might be done to help toward writing a permanent tariff. It is hoped that some of the difficulties will be removed after the disarmament conference has taken place and when peace with Germany has been declared. Surface indications are, however, that the President views tariff legislation at this time as a detriment instead of a help to the nation. The change in the make-up of the tariff commission is also indicative of lack of harmony on principles and policy.

Municipal Electricians Urged to Uphold National Electrical Code

THE twenty-sixth annual convention of the International Association of Municipal Electricians, held at Colorado Springs, Sept. 6 to 9, was one of the most interesting, from the standpoint of papers discussed, held in several years. Several amendments were adopted for presentation to the National Board of Fire Underwriters with regard to fire-alarm installation rules. This was in continuation of a discussion held in the 1920 convention.

Among the important papers read was one on "Paper Insulation Versus Rubber Insulation for Fire and Police Underground Cables," by T. P. Sandiford, city electrician, Savannah, Ga. It was the general opinion that local conditions have much to do with the proper kind of insulation and that in some cases paper insulation can be used successfully, especially in police signal systems, although many prefer rubber-insulated fire-alarm cables.

W. S. Boyd, secretary of the Western Association of Electrical Inspectors, in a paper entitled "The Relation of the National Electrical Code to the Electrical Industry," deplored the action of the engineering press in giving voice to any arraignment of the code and urged the upholding of the code by every means. Upon his suggestion a resolution was adopted in which the association pledged itself to recognize the National Electrical Code as the standard for electric wiring.

Other papers related to street lighting, traffic signals, fire-alarm and police-telegraph systems.

The election of officers resulted as follows: President, W. R. Arbuckle, superintendent fire and police telegraph, Bayonne, N. J.; first vice-president, Charles P. Steinmetz, Schenectady, N. Y.; second vice-president, J. L. Caldwell, superintendent fire alarm, Colorado Springs; third vice-president, D. R. Snyder, superintendent electrical department, Augusta, Ga.; fourth vice-president, John Southwell, superintendent fire alarm, Beaumont, Tex.; secretary, Clarence R. George, Houston, Tex. (re-elected for twelfth consecutive term); treasurer, William Crane, city electrician, Erie, Pa.

New York's Electrical Show Emphasizes Electric Home Appeal

WITH emphasis on household use rather than industrial application, the fourteenth annual New York Electrical Show opened Wednesday evening in the Seventy-first Regiment Armory to run for ten days. Approximately 450 appliances are being demonstrated in the eighty exhibits that compose the exposition. As usual, the management has arranged a number of special features which attract considerable attention, not the least of which is the "home electric" with the electrified furniture wired under the direction of Joseph F. Becker, commercial manager of the United Electric Light & Power Company, and who is chairman of the new N. E. L. A. committee that is developing this idea.

The elimination tournament for the American open wireless championship was held this week, and other wireless features helped to stimulate public interest in the show.

Electric trucks have a prominent place at the show, as might be expected, since New York City is the greatest single electric transportation market.

The management of the show is particularly pleased over the interest shown this year. Never before, it is stated, was the demand for space so insistent. As a result all of the available space was disposed of at an early date.

Iron and Steel Men Discuss Development in Electric Main-Roll Drive

DECIDED economies were claimed for the electric motor as applied to main-roll drive in steel mills, when compared with steam drive, in the report of the electrical development committee of the Association of Iron and Steel Electrical Engineers submitted at the convention of that body in Chicago last week. It is perfectly feasible to operate an electrically driven blooming mill with two men in the pulpit as compared with the minimum of three required by steam operation, the committee declared, and several instances were cited to back the statement. One 40-in. mill at Sparrows Point, Md., has been successfully operated since last April without slowing up the work of the mill in any respect. In the case of a 60-in. reversing plate mill two operators handle the mill as against a minimum of four for the steam-operated mills at other plants.

An important event noted by the committee is the replacement this year of a twin-tandem reversing engine driving the first finishing stand of the Lackawanna rail mill by an 8,000-hp., 50-deg. motor which, it is said, has the highest continuous horsepower capacity of any electric reversing drive in the world. It was designed to roll the first four of the last five passes on a 150-lb. rail section at the rate of 240 gross tons per hour. The maximum production so far has been at the rate of 198 gross tons per hour, exceeding all previous tonnage records on this mill. The last pass is made in an adjacent mill driven by a separate engine, but the record was made with the last finishing stand

disconnected from its engine and connected to the first finishing stand so that the motor was rolling five instead of four passes.

The committee also noted the tapping of the first heats from two 40-ton Heroult furnaces at the government armor plant, Charleston, W. Va., on Feb. 2 of this year. These furnaces take molten steel from basic open-hearth furnaces and complete the refining, producing a very high-class steel. A new design of contactor with which some plants have experienced a life of fifteen to twenty times that of the older designs is noted in control equipment. The committee stated as its opinion that probably the greatest single opportunity for electrical development in the steel industry at the present time lies in the steel-plant railroad field. Thus far this field has gone little beyond the investigation stage.

INDUCTION-MOTOR STARTING

In dealing with the induction-motor starting developments Millard C. Spencer described a form of compensator in which the second rush of current experienced with the ordinary form of compensator is reduced. A certain percentage of the line voltage is applied to the motor terminals by means of two auto-transformers connected in open delta in the usual way. The second step is to disconnect a portion of the auto-transformer windings, leaving the remainder connected as choke coils, which in turn are short-circuited and finally disconnected from the line entirely. The method has the advantage of keeping power on the motor during the entire sequence of operations, considerably reducing the sparking at the switch contacts, as the entire circuit is never opened. Another means is a signal device by which the operator may know when the current drawn by the motor has reached a low enough value to make it safe to throw the starter from the starting to the running position. Mr. Spencer said that recent developments in induction-motor starting designs seem to be toward strict interchangeability throughout, simplification of the wiring, complete accessibility of all parts and the design of overload relays as temperature-operated devices, rather than mechanical time-limit devices for protecting motors against injury due to overheating.

A saving of 23 per cent in fixed costs, a return of 10.5 per cent on the investment in battery locomotives and a saving of 41 per cent, with a return on the investment of 16.9 per cent on straight electric locomotives as compared with steam locomotives, was shown in the paper by R. B. Gebhardt, electrical superintendent of the Bethlehem Steel Company at the Sparrows Point plant, in his study of the electrification of a steel-plant railroad having a total trackage of 57 miles and using a total of twenty-seven steam locomotives ranging from 75 tons in size to 25 tons. Twenty-seven battery or twenty-three straight electric locomotives were assumed as necessary to do the work. For standardization purposes and flexibility of operation the author assumed that the locomotives would be of either 40-ton or 80-ton size, the latter being made up of two 40-ton locomotives.

With the yard electrified, Mr. Gebhardt indicated the next step as the electrification of the locomotive cranes. The greatest item of saving in this case would be in the additional amount of work that would be done, since experience shows that the general average of lost time due to the cranes having to drop their work and go for water is 50 per cent of the total. The author reached the conclusion that the third rail is the most satisfactory system, owing to the elimination of the interference from overhead trolley wires in the yard. He prefers the underneath-contact type of third rail because of the ease with which it can be guarded and points to a record of many years' use of this construction without accidents on blast furnace trestles. He regards 250 volts direct current as the rating most suitable for use with yard locomotives. The use of a higher voltage would introduce hazards that would be considerably more difficult to handle. Where the third rail may be objectionable for special reasons, Mr. Gebhardt proposes the use of reels on the locomotives to carry 500 ft. or less of service cable.

The educational committee presented a "Crane Operators' Manual" as a result of its year of work. In addition to instructions in operating matters and inspection, the manual includes some elementary theory of electric operation and operating instructions for knife, magnetic and limit switches, fuses and overhead relays.

The committee on electric furnaces concluded that just as good steel can be made using dual voltages as with one voltage, provided that the melting voltage is not too high. It also held that better economies can be secured electrically and from refractories with dual voltages. A total of 356 electric steel furnaces was reported for this country on Jan. 1, 1921, and the committee believed that the number had not been increased up to the date of the report. The committee stated its belief that, owing to conditions in the industrial field, the year 1921 will go down in history as the low-water mark in the growth of the electric furnace since the beginning of its advance more than ten years ago.

SPECIFICATIONS OF STANDARDIZATION COMMITTEE

The standardization committee presented specifications for electric overhead traveling cranes and also the reports of the sub-committees on motors and illumination. There was some criticism of the crane specifications as too liberal, the committee having made them general to permit of all possible leeway in purchasing and still insure that the builders would conform to standard specifications and put the bids on a competitive basis. The report of the sub-committee on motors showed that the general specifications for alternating-current motors have been revised and further revision will not be necessary until there are further developments in the art. Uniform dimensions for direct-current mill-type auxiliary motors were suggested, and also a reduction in the number of sizes to eight, ranging from 10 hp. to 150 hp. The discussion favored seven sizes ranging from 6 hp., a size frequently large enough for crane operation, to 175 hp. The 50-deg. motor rating for alternating-current auxiliary-service motors with the 40-deg. rating shown on the nameplate was recommended. For direct-current motors other than the standard mill type used in the auxiliary service the 40-deg. rating for motors using class A insulation was indorsed.

The officers elected were: President, W. S. Hall, Illinois Steel Company; first vice-president, R. B. Gebhardt, Bethlehem Steel Company; second vice-president, L. F. Galbraith, West Penn Steel Company; treasurer, James Parrington, La Belle Iron Works; secretary, J. F. Kelly, Pittsburgh. The new directors will be R. R. Sheppard, Steel & Tube Company of America; I. N. Tull, McKinney Steel Company; F. H. Woodhull, Lukens Steel Company, and W. H. Gilbert, Tennessee Coal, Iron & Railroad Company.

Society for Electrical Development Announces Christmas Campaign

WITH the mailing to the trade of a folder describing plans and selling helps the Society for Electrical Development is about to launch its seventh annual campaign to help the electrical industry promote the buying of electrical Christmas gifts. The first page of the announcemen' will carry a greeting and a few comments from William L. Goodwin.

The three major selling helps offered by the society this year are, according to its announcement: (1) An elaborate set of window display cut-outs; (2) a set of store and window display cards including one large card with eight smaller price or suggestion cards; (3) an eight-page folder including an invitation to visit the dealer's store together with many illustrated gift suggestions. This is designed to be mailed to prospective customers, to be inclosed with letters or distributed at the store.

The keynote of the campaign is expressed by the slogan, "Bring back business by getting busy selling."

Progress in Lighting Told at I. E. S. Convention

THE outstanding features of the fifteenth annual convention of the Illuminating Engineering Society, held in Rochester, N. Y., this week, were a brief report on the Paris meeting of the International Commission on Illumination, the presentation of an amplified lighting code, the announcement of a new light source, and the report on progress in lighting. Among other valuable contributions to the literature of illumination there were a classical report on the effect of light intensity and composition on ocular functions and some valuable statistics on the relation between illumination and traffic accidents. In all, twenty-six papers, for the most part of a scientific nature, were presented.

The International Commission on Illumination, which was attended by delegates from Great Britain, France, Switzerland, Spain and Italy, decided on the definitions of three of the fundamental ideas of illumination and the corresponding units, namely, the lumen, the lux and the international candle. This decision is considered by the Illuminating Engineering Society as a long step toward general international concordance on technical ideas. The addition of tables for classifying light sources from the standpoint of glare was considered the greatest single contribution to the revised code of lighting.

The new light source which was announced is called the neon-tungsten arc-incandescent lamp and consists of two slightly separated helical tungsten electrodes inclosed by a bulb containing neon gas. The lamp is self-starting, commencing with a reddish corona discharge which gradually develops into an intense white light.

In the report on progress in lighting, which contained seventy-three pages, it was pointed out that while developments in light sources have not been marked, considerable improvement of searchlamps is going on. Some cities have proceeded with street-lighting improvements despite business conditions, two new types of street lighting having been reported. A big step forward has been made by standardization of fixture accessories.

Among the social functions of the convention were the president's reception and dance on Monday evening in the ballroom of the Rochester Club, automobile trips to various places of civic and engineering interest, a banquet at the Powers Hotel, where the convention was held, on Wednesday evening, and the induction of the president-elect, Dr. George S. Crampton. Between 150 and 200 persons attended the convention.

September Financing Shows Indications of Easier Money

DURING the month of September the total amount of stocks and bonds of the electric light and power companies offered to investors equaled $40,560,000, the figure denoting almost twice the total reported for August and an increase of more than $14,000,000 over September of last year. Attention is called to the low yield on several of the issues. For example, on an issue of $13,500,000 offered by the Toledo Edison Company the per cent yield was only 7.33. The month's flotation is again characterized for the most part by long-term investments and also by two unusually high single issues—the issue of $13,500,000 just referred to and a nine-million-dollar issue offered by the Consolidated Gas, Electric Light & Power Company of Baltimore, yielding 7.35 per cent. An issue of a quarter of a million of ten-year 8 per cent bonds of the Pacific Power & Light Company sold at a premium.

Name of Company	Amount of Issue	Period	Class of Security	Purpose of Issue	Rate of Interest	Per Cent Yield	Offered At
Standard Gas & Electric Co.	$3,500,000	20-yr.	Secured sinking-fund gold bonds	Payment of notes	7.5	8.10	94
Pacific Power & Light Co.	250,000	10-yr.	First lien and general mortgage gold bonds of 1920	.....	8	7.90	100½
Nevada-California Electric Corp.	100,000	10-yr.	Convertible debentures of 1916	.....	6	8.55	90½
Appalachian Power Co.	2,500,000	15-yr.	Secured gold bonds	To retire maturing notes	7	8.15	90
Puget Sound Power & Light Co.	1,000,000	5-yr.	Gold coupon notes	Expansion and development	8	.....	.....
Toledo Traction, Light & Power Co.	2,500,000	1½-yr.	First lien gold bonds	.....	7	8.40	98½
Consumers' Power Co. (Michigan)	1,500,000	15-yr.	General and refunding mortgage gold bonds, series B	.....	7	7.50	95½
Midland Counties Public Service Corp	800,000	35-yr.	General and refunding mortgage gold bonds	Refund floating debt	7½	7½	Par
Northern States Power Co. (Minnesota)	1,500,000	20½-yr.	First and refunding mortgage bonds of 1916	.....	6	6.75	92
Toledo Edison Co.	13,500,000	20-yr.	First mortgage gold bonds	.....	7	7.33	96½
Western States Gas & Electric Co. (California)	2,500,000		Prior preferred stock cumulative, series A	.....	8	8.15	98
	600,000	6½-yr.	Gold notes of 1917	Retire floating debt and extensions and additions	6	8.30	90
El Paso Electric Co.	750,000	4-yr.	Gold notes, series A of 1920	.....	7	8	96½
Lexington Utilities Co.	560,000	15-yr.	First lien and refunding gold bonds, series B	Extensions and improvements to property	6	8	83
Consolidated Gas, Electric Light & Power Co. of Baltimore	9,000,000	10-yr.	First refunding mortgage sinking fund gold bonds, series C, convertible	New construction	7	7.35	97½
Total	$40,560,000						

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

"Brighter Brooklyn" Movement Inaugurated.—Municipal authorities and other prominent citizens of the borough of Brooklyn, in New York City, are promoting a movement for better illumination. As a first step in this "Brighter Brooklyn" project there was held a week or two ago a celebration on the occasion of floodlighting the tower of the Borough Hall. Addresses were made by officials of the borough as well as by G. H. Stickney, representing the Edison Lamp Works.

Electricity Comes to the Aid of Motion-Picture Patrons.—The difficulty of finding a seat in a dark and well-filled motion-picture house has been done away with in a large Los Angeles theater by a master electrical board situated in the lobby containing a small light bulb for each seat in the auditorium, arranged according to rows. Each of these bulbs is connected with its corresponding seat by a wire. When a pressure greater than thirty pounds is brought to bear on the seat, the electrical contact is broken and the light on the board goes out.

Electric Vehicles Gaining Popularity in Italy.—The great hydro-electric development going on in Italy has led to a marked cheapening of electrical power in that country, and this in turn has resulted in a distinct increase in the number of electrically driven vehicles, particularly for heavy traffic. Electric vehicles are, according to the London *Engineer*, especially popular in Milan, where several electric garages have been established which operate electric omnibuses for most of the large hotels and conduct a regular express trucking service between Milan and Bergamo. A company has been formed, with a capital of 3,000,000 lire, to manufacture and sell electric vehicles.

Electrical Energy from Wind Power.—An interesting method of tackling the problem set by the small wind-power electric generating plant has, according to *Engineering*, been developed by a British manufacturing company. In place of the usual fan or wind wheel of fairly large diameter set at the top of a latticed tower and driving a dynamo through gearing, a number of small dynamos with impellers mounted directly on their spindles are employed. The dynamos are carried at the top of the tower, which consists simply of a tubular pole with a tubular cross-bar on which the machinery is mounted. The dynamos are each rated at 40 watts and are self-regulating for battery charging, which is commenced with a wind of 15 miles an hour. Output increases with an increase in the velocity of the wind, and it is claimed that power may be obtained during high winds and gales that would make it necessary to disconnect the ordinary apparatus. A feature of the system is an automatic cut-out which breaks the connection when the wind falls below the desired velocity and establishes it again when the velocity increases.

Hydro-Electricity in Finland.—Details of the hydro-electric possibilities of the Imatra group of rapids in Finland reported by a British vice-consul say that these water-power sources are among the most important in the country. They are on the Vucksen River between Lakes Saima and Ladoga. The Saima system has a water area of about 60,000 sq.km., and the difference in level between Lake Saima and Lake Ladoga is more than 65 m., nearly all of which falls in a distance of 24 km., where there are ten different rapids. Of all the potential power a very small part is yet developed.

Denver's First Electrical Home.—Through the efforts of the Electrical Co-operative League of Denver a desirable boulevard building site 2½ miles from the business center was purchased and construction of the city's first electrical home started early in September. It is planned to have the house completed and furnished so as to be ready for exhibition about Thanksgiving time. S. W. Bishop, executive manager of the league, was elected secretary and treasurer of the twenty-five-thousand-dollar corporation that is erecting the seven-room house, which is of Spanish architecture and will have more than a hundred outlets.

Some Ancient Electrical History.—Few electrical men think of the electric light as going further back than Edison's first experiments in the "seventies," but here comes an antiquarian who, writing for the *Electrical Times* of London, recounts some striking experiments made in the "thirties" and "forties" with no better equipment than primary batteries. The real début of the electric light, he says, was in 1836, when it was employed to produce the effect of the rising sun at the Paris opera house. The first really important results were produced in 1843, when four or five thousand persons saw an illumination in the Place de la Concorde, Paris, that dimmed the surrounding gaslights and made it possible to read moderate-sized print at a distance of a hundred yards from the light source. Four years later "the evening gazers in London were astonished by the occasional flashes of intense light thrown out upon them from elevated spots. At one time it was the National Gallery, at another the north tower of Hungerford Bridge, at another the Duke of York's column, at another the Polytechnic Institution, which was made the theater for the exhibition of these results, and for a time the talk of the town was the electric light and its marvels."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

American Association of Operating Engineers.—The second regular meeting of this association will be held with the Alabama Power Company, Oct. 6, 7 and 8, at Birmingham, Ala.

Institute of Radio Engineers. — The Institute of Radio Engineers will meet on Wednesday, Oct. 5, at 8:15 p.m., in the Engineering Societies Building, New York City. A paper on "A New Rectifier" will be presented by V. Bush and C. G. Smith.

A. I. E. E., Providence Section.—S. O. Hayes, electrical engineer with the Westinghouse Electric & Manufacturing Company, will discuss "European Practice in Electrical Switch Gear and Transmission" before this section of the Institute on Friday, Oct. 7, at 8 p.m.

American Electric Railway Association Convention.—The program of the A. E. R. A. convention to be held at Atlantic City next week from Monday to Friday is divided between general sessions and sessions of the Engineering Association, the Claims Association, the Transportation and Traffic Association and the Accountants' Association. Among the engineering features will be the reports of the committees on heavy electric traction, power generation and power distribution. Of these three committees the chairmen are respectively Sidney Withington, electrical engineer New York, New Haven & Hartford Railroad; A. B. Stitzer, chief engineer Republic Engineers, Inc., New York City, and Charles R. Harte, construction engineer Connecticut Company, New Haven, Conn. George B. Muldaur, general agent Underwriters' Laboratories, New York City, will present a paper on the work of the laboratories. Secretary of Commerce Hoover has been invited to address the convention on the use of electric railways in improving industrial efficiency.

Coming Meetings of Electrical and Other Technical Societies

American Electric Railway Association—Atlantic City, N. J., Oct. 3-7.

Indiana State Association of Electrical Contractors and Dealers — Indianapolis, Oct. 5 and 6.

Empire State Gas and Electric Association—Lake Placid, N. Y., Oct. 6 and 7.

National Association of Railway and Utilities Commissioners—Atlanta, Ga., Oct. 11-14.

N. E. L. A., Southeastern Section—Chattanooga, Tenn., Oct. 17-19.

A. I. E. E., New York Section—New York, Oct 19.

Electrical Supply Jobbers' Association, Atlantic Division—Philadelphia, Oct. 20.

A. I. and S. E. E., Philadelphia Section—Philadelphia, Nov. 5.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Unless Constitutional Question Is Clearly Raised Supreme Court Cannot Consider It.—An allegation that a certain statute was "unconstitutional and void," made in a personal injury suit (Johnson vs. Kansas City Electric Light Company), indicates nothing, according to the Kansas City Court of Appeals and does not give the State Supreme Court jurisdiction over an appeal from judgment, the rule being that a party attempting to raise a constitutional question must put his finger on the specific provision of the Constitution that he asserts to have been injured. (232 S. W. 1094.)*

Findings of Commission Not Res Judicata.—In annulling water rates fixed by the California Railroad Commission and appealed against in Stratton vs. that body, the Supreme Court of California said: "The Railroad Commission is essentially an administrative and legislative tribunal, and not a judicial tribunal in a strict sense, though many of its functions are quasi-judicial, so that its orders are not judgments and its findings of fact are not adjudications, and the facts found by it are not res judicata and as such finally and conclusively established between the parties for all purposes." (198 Pac. 1051.)

Powers of Pennsylvania Commission.—The Public Service Commission may, according to the decision of the Supreme Court of Pennsylvania in Coplay Cement Manufacturing Company vs. Public Service Commission of Pennsylvania, increase rates prior to the effective date of a previous increase pending the determination by the commission of a complaint against such prior increase, the commission having the power in such case to consolidate the several schedules of rate increases and to cause the complaint, the record and the evidence to be taken as a complaint, record and evidence in connection with the new rate. (114 At. 649.)

Liability for Lawful Act of Employee Causing Accident.—In a suit (Barva vs. United Telephone Company) brought against a telephone company to recover damages for injuries caused by a horse running away, the horse having been frightened when a telephone lineman tossed a glass insulator to another lineman on a pole, the Indiana Appellate Court held that the act of the lineman was a lawful one and that negligence could not be predicated upon it in the absence of evidence that the time, circumstances or manner of doing it manifested failure to exercise due care for the safety of others. (131 N. E. 794.)

Company Not Responsible for Death of Boy "Unlawfully" at Place Where He Was Killed.—In Roberts vs. Key West Electric Company damages were awarded in the trial court because of the death of a young boy who while climing on a shed belonging to the house where a playmate lived was killed by electricity escaping along a tin roof from an electric light wire from which insulation had been worn away. The Supreme Court of Florida reversed the verdict, holding that, the wires carrying only 110 volts and no complaint having been made, the company had been held to too high a degree of care, and also that the boy was not "lawfully" in the place where he was killed inasmuch as he had climbed the shed without invitation and after having been ordered away by his playmate, with whom he had quarreled. (89 So. 123.)

Responsibility for Contact Between Electric Lighting and Telephone Wires.—In Johnson vs. Kansas City Electric Light Company, damages awarded for injuries sustained by a builder who while in a vacant house came into contact with an uninsulated telephone wire against which a transmission line carrying 2,300 volts had sagged were sustained by the Kansas City (Mo.) Court of Appeals, which held that whether the electric company knew or should have known of the danger was a question for the jury, that it was not necessary to defendant's liability that it should have apprehended the particular injury which happened, that it was proper to instruct the jury on the company's duty of inspection, and that testimony introduced in rebuttal of medical testimony attributing plaintiff's condition in part to another cause was admissible and pertinent. (232 S. W. 1094.)

Commission Without Jurisdiction Over Lessor Companies.—The Supreme Court of Pennsylvania, in Philadelphia City Passenger Railway Company vs. Public Service Commission of Pennsylvania, found that the commission has no jurisdiction over a public service company which under legislative authority has leased its franchise and property to another corporation, since such a company has no rates to make or collect, no service to render the public and no facilities to furnish or extend. The commission has no jurisdiction over leases of public service property by one corporation to another or over the rate of rentals reserved thereby, since it is concerned only with the rendition of service by the operating company at reasonable rates, and it is immaterial if the operating company under its lease must pay an unreasonable rental to the lessor and is thereby prevented from earning a reasonable rate of return on its investment. (114 At. 142.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Extension of Service to Unprofitable Customers.—The Idaho Public Utilities Commission has refused to compel the Wood River Power Company to extend service to certain would-be customers at Ketchum, a summer resort which has only about 100 year-around residents. The complainants objected to the company's requiring prepayments and five-year contracts, but desired, on their own part, that cooking and heating service should be rendered them. This demand the commission found unreasonable, inasmuch as to meet it the company would have had to change its transmission system from single-phase to three-phase at an expense which the additional revenue would not justify. The commission found that cooking and heating service could not reasonably be required under present conditions.

Importance of Company Credit.—These observations on the desirability of a public utility's having a revenue sufficient to maintain its credit were made by the Maine Public Utilities Commission: "The matter of credit is of just as much importance to the customer as it is to the company. The company has no place to go for money except to its customers. If because of impaired credit a particular company is unable to obtain necessary funds except at an exorbitant rate of interest, the customers of that company must in some way contribute the income necessary to produce this interest, or else be willing to accept the kind of service capable of being rendered with impaired and more or less useless facilities. Under normal conditions the company whose credit and standing are good will be able to obtain necessary funds on better terms than a company whose standing is such that investors have need to be fearful not only of the payment of interest or dividends but also for the security of the principal. It follows that a company in good standing saves in interest charges or in the discount upon the sale of its securities a considerable sum each year. This means a saving to the customers; hence it is of advantage to each customer to have the company serving him in such a financial condition that that part of the operating expense which represents interest charges is as low as possible. It is also a fact that the employees of a company that is reasonably prosperous and is functioning properly have more heart and courage in their work than do the employees of a company that is just hanging on the ragged edge."

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

James T. Hutchings, formerly president and general manager of the Rochester (N. Y.) Gas & Electric Company and now general manager of the

J. T. HUTCHINGS

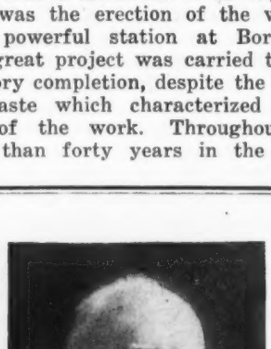
United Gas Improvement Company of Philadelphia, was the subject of a biographical sketch in last week's "Men of the Industry." By an unfortunate error the portrait printed with the sketch of Mr. Hutchings was not his, but that of C. B. Hutchinson of the Southern California Edison Company. The ELECTRICAL WORLD prints herewith the picture that should have accompanied its notice of Mr. Hutchings and in the opposite column reproduces Mr. Hutchinson's picture with the sketch that had been prepared to accompany it. The editors tender to both gentlemen their apology for the mistake—one of the kind that even eternal vigilance cannot always prevent in the hurried and complicated processes of modern newspaper making.

J. C. Festerly, formerly of Canton, Ohio, has been appointed manager of the United Electric Company at Bucyrus, Ohio.

Hugh S. Riddell, who has been connected with the Greenfield (Mass.) Electric Light & Power Company for eleven years, for the greater part of the time as manager, has resigned on account of ill health.

George Shortmeier, formerly New York manager for the Madison Rubber Company and later district manager at New York for the Sinclair Oil Company, has been placed in charge of the New York office of the American Bosch Magneto Corporation, succeeding O. S. Stanley.

Robert Stanislaus Griffin, for more than eight years the head of the Bureau of Engineering of the Navy Department and engineer-in-chief of the United States Navy, terminated his long period of active service on Sept. 22 and retired to private life. Among the noteworthy accomplishments of Admiral Griffin is his introduction of electric propulsion on battleships, which was put into effect many years earlier than would have been the case had he been a less determined champion of that type of drive. In reviewing the work of the Bureau of Engineering under his administration Admiral Griffin subordinates everything else to the accomplishments of his organization during the war. The engineering features of the maintenance of an enormous fleet were carried out with a success which has called forth the highest praise from the British and the French. Among other developments of which Admiral Griffin can be justly proud is the work done by his bureau on radio. Under his direction high-powered stations have been built on the Isthmus, at San Diego, at Pearl Harbor, at Cavite and at Annapolis. The greatest achievement of all, however, was the erection of the world's most powerful station at Bordeaux. This great project was carried to satisfactory completion, despite the feverish haste which characterized every step of the work. Throughout his more than forty years in the naval



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R. S. GRIFFIN

service Admiral Griffin has been an active contender for an increased proportion of engineering talent in the navy personnel. He was born in Fredericksburg, Va., Sept. 27, 1857, and was graduated from the Naval Academy in 1878. He holds the degrees of doctor of engineering from the Stevens Institute of Technology and doctor of science from Columbia University. For his services during the war a distinguished service medal was awarded to him, he was made a commander of the Legion of Honor of France and was elected an honorary member of the American Society of Mechanical Engineers.

C. B. Hutchinson has recently been transferred from the San Pedro district of the Southern California Edi-

C. B. HUTCHINSON

son Company to its newly organized Fullerton district, where he will be the district manager. Mr. Hutchinson has spent almost his entire life in southern California, where he was formerly connected with the Salt Lake Railway Company in the operating and traffic departments. He resigned his position with that company in 1916 to enter the employ of the Southern California Edison Company, where he has served successively as salesman, assistant district manager and district manager.

J. H. Sundmaker, for eight years chief engineer and director of all subsidiaries of the Ohio Electric Railway, with headquarters at Springfield, Ohio, has resigned and opened an office in Cincinnati as a consulting engineer.

Carl K. Chapin, formerly general manager of the Brady Utility Company, Memphis, Tenn., has been appointed Southwestern representative of the *Journal of Electricity and Western Industry*, with headquarters at Pasadena, Cal.

R. L. Ellis, formerly general manager of the Selma (Ala.) Lighting Company, is now manager of the Miami (Fla.) Beach Electric Company, which operates a small plant and furnishes power and street-railway service in Miami. Between the time Mr. Ellis resigned from the Selma Lighting Company and the taking up of his new duties he was engaged in war work and for about two and a half years was with the Semet Solvay Company.

Miss Olive A. Bursiel, secretary of the New England Division, National Electric Light Association, has been appointed a member of the woman's public information committee of the Public Relations National Section of the association, the object of which is to formulate and apply plans for the education of the women of the country in the fundamental economic principles of the electric light and power business and the interdependence of the public and the industry. Miss Bursiel is a native of Bedford, N. H., and is a graduate of the secretarial course of the Bryant & Stratton School, Boston. She entered the electrical industry about

MISS OLIVE A. BURSILL

thirteen years ago as a stenographer for the New England Telephone & Telegraph Company in the engineering department at Boston and shortly afterward joined the staff of the Edison Electric Illuminating Company of Boston, almost immediately serving as secretary to the superintendent of the advertising department. In 1910 she became assistant secretary of the recently formed New England Section of the N. E. L. A. and in 1911 was appointed its secretary. The membership has since increased from 272 to 1,334, and there are now about twenty divisional committees, in the work of which Miss Bursiel is closely absorbed as well as in the general work of the division. To her loyalty, reliability, boundless and unflagging energy is due in no small measure the successful growth of the New England Division from small beginnings to its present influential status in national and regional electrical affairs. Miss Bursiel is a member of the Commonwealth Country Club and Woman's City Club of Boston, and of The Durant, Inc.

Carl F. Dietz, vice-president and sales manager of the Norton Company, Worcester, Mass., has resigned to become president and general manager of the Bridgeport (Conn.) Brass Company. He succeeds as president Fred J. Kingsbury of New Haven, who becomes chairman of the board of directors. Mr. Dietz has been connected with the Norton Company for ten years, first as plant engineer, then as assistant sales manager, and afterward as sales manager of the wheel division of the business. Two years ago, when the Norton Company and the Norton Grinding Company were consolidated, he was made vice-president and sales manager. He was born in New York, Feb. 12, 1880, was graduated from Stevens Institute of Technology in 1901, and subsequently took post-graduate courses in the Royal Technical College, Berlin, in sciences, metallurgy and mining. Early in his career he was employed for three years at plants of the United States Steel Corporation, largely in blast-furnace operation and large gas-engine installations. In 1905 he engaged in the development of zinc-smelting processes and later operated a mining lease in Utah, installing a dry method for concentrating lead-silver ores. He designed and built modern ore-milling plants for the American Glue Company as a part of its sandpaper factory at East Walpole, Mass.; for the Grosselli Chemical Company, Park City, Utah, where the separation of iron and zinc sulphides was the problem, and for the Ozark Smelting & Mining Company, Magdalena, N. M., where zinc ore required concentration for paint making. In 1908 he joined the Minerals Separation, Ltd., London, as consulting engineer and in the interest of this company developed treatment methods at the Dunderland iron-ore deposits in Norway, north of the Arctic Circle, and studied ore treatment methods for properties in Russia, Bolivia, Australia and Africa. He put into operation the San Francisco del Oro mines in Mexico, yielding complex lead and silver ores. He is a member of the American Society of Mechanical Engineers and the American Institute of Mining and Metallurgical Engineers.

J. C. Van Duyne, who has not been in good health for some time, has resigned as auditor of the Brooklyn

J. C. VAN DUYNE

Edison Company and is taking a much-needed rest. Mr. Van Duyne was chairman of the Accounting Section of the N. E. L. A. during the last administration. He had been auditor of the Brooklyn Edison Company since Dec. 1, 1912. For seventeen years prior to that he was employed by the New York Edison Company, during the last nine years of which he was chief of the company's collection bureau.

L. R. Wallis, newly appointed chairman of the Lighting Sales Bureau of the National Electric Light Association, is widely known in the central-station industry as a commercial executive and close student of service economics. He is a native of Beverly, Mass., and first entered the electrical business in January, 1888, at that time being associated with the Bernstein Electric Com-

L. R. WALLIS

pany of Boston. Later he was New England agent for the Buckeye Electric Company of Cleveland. In 1891 Mr. Wallis entered the electric light and power field as manager of the Wakefield (Mass.) Gas & Electric Company. Three years later the company sold its plant to the town, and Mr. Wallis, with others who had been interested in the development of the Wakefield property, built a new gas plant at Laconia, N. H. In 1897 he returned to Massachusetts as manager and treasurer of the Woburn Light, Heat & Power Company and was personally in charge of the building of its generating plant. In 1903 this property was purchased by the Edison Electric Illuminating Company of Boston, and in 1906 Mr. Wallis became associated with that organization. For the past eleven years he has been superintendent of the sales department. He has been interested in the development of the New England Division, N. E. L. A., since its organization and has been active in the work of the national body. Last year he was chairman of the committee on the compensation of salesmen and vice-chairman of the Lighting Sales Bureau. He is a member of the Illuminating Engineering Society, the Boston City Club, and also of the committee on industrial lighting of the Association of Edison Electric Illuminating Companies.

Arthur J. Carpenter has become manager of the Westchester Electric Supply Company at Tarrytown, N. Y.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Westinghouse Business Estimated at 65 per Cent of Last Year's Rate

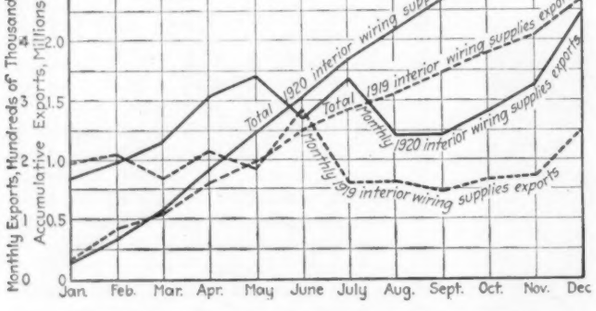
WESTINGHOUSE Electric & Manufacturing Company for its fiscal year ended March 31, 1921, showed billings of just under $151,000,000. Estimates of incoming business for the present year place business at the rate of $100,000,000, indicating that orders are running at the rate of almost 67 per cent of last year's business. The opinions expressed by the men of this company in the field show an evenly divided feeling that the bottom of the buying trend has been reached and that the fall business will show improvement.

A further reduction in pay roll has been announced to take effect Oct. 1. This will take the form of a reduction in salaries to a maximum of 10 per cent based on a sliding scale recognizing length of service and rate of increase during the last five years. A 10 per cent reduction will be placed on ordinary labor. On March 11 last a wage reduction of 15 per cent became effective.

Wiring-Device Exports of 1920 Were 46 per Cent Above 1919

AN ANALYSIS of the exports of interior wiring supplies, including fixtures, for the calendar year 1920 shows some interesting figures in regard to the markets for this class of electrical equipment. In the first place, the value of these exports in 1920 was $3,386,068, an increase of 46 per cent over the exports of the year 1919, when they amounted to $2,319,485. In 1918 the value was $1,428,615, a figure which was surpassed in 1920 by 113 per cent.

The general trend of the curves of monthly exports for



SIMILAR MONTHS FOLLOW SAME GENERAL TREND DURING MOST OF YEAR

the two years of 1920 and 1919 is virtually the same over the last six months of each year, except that the monthly values of the last three months in 1920 increased more rapidly than over the same period of 1919.

In the accompanying table, figures for which were compiled by the ELECTRICAL WORLD from data received from the Bureau of Foreign and Domestic Commerce, it is shown that in the year 1920 twenty-three countries imported American-made interior wiring devices and fixtures in amounts over $25,000. These countries took virtually 90 per cent of the American exports, while the 10 per cent remaining were divided up between fifty-four other countries totaling less than $25,000.

The North American continent, including Panama and Cuba, imported $1,589,697 worth, 47 per cent of the total exports. Canada was the highest importing country, with $956,739 worth, the next country being Cuba, a very poor

EXPORTS OF INTERIOR WIRING DEVICES IN 1920

Canada	$956,739	Spain	$47,655
Cuba	379,325	Panama	44,341
Brazil	253,193	Norway	43,268
Mexico	209,292	Uruguay	36,919
Argentina	148,398	Dutch East Indies	35,085
Philippine Islands	125,954	Italy	33,407
China	120,382	Hong Kong	32,531
England	115,878	Sweden	30,721
Australia	101,045	Belgium	26,998
France	76,938	Fifty-four other countries importing interior wiring supplies	342,493
Peru	63,246		
Colombia	57,398		
Japan	53,851		
Chile	51,011	Total	$3,386,068

second. The remainder of the list are separated by only relatively small amounts. Mexico, in this commodity as in others, is ranking high in imports.

South American countries took 18 per cent of all the exports, or $610,165 in value, embracing in the list six of the principal states on that continent—Argentina, Brazil, Chile, Colombia, Peru and Uruguay. The European states of England, France, Belgium, Spain, Italy, Norway and Sweden took a total value in wiring devices of $374,865, 11 per cent of the total. China, Japan and Hong Kong imported 6 per cent, and the Philippine Islands, Dutch East Indies and Australia took 7.7 per cent of the total.

Range Manufacturers Show Increasing Sales for 1921

FROM the expressions of several manufacturers of electric ranges, the sale of these ranges for the year 1921 is expected to surpass that of 1920 by a large margin. On the other hand, the expression is heard that 1921 sales will not even equal, much less exceed, those of last year. Representative opinions show that range sales over the first seven or eight months of this year have surpassed those of the same period of 1920 by from 25 to 200 per cent. The latter figure, however, is an extreme case, figures from 25 to 50 per cent being in the majority.

Different parts of the country are affected differently in this matter, depending to a large extent upon the attitude of central-station companies toward electric range business. Of course, with the help and backing of the utility it would be expected that the sales would increase, and some companies have been very active in this direction. On the other hand, where the utilities have discouraged the sales it is generally because their lines are already loaded and they have no additional capacity to turn into them.

One range manufacturer reports some utilities as refusing to be interested in any appliances that cannot be attached to lamp sockets. Another reports central-station companies generally active in making range sales, realizing the value of this load. Other reports balance one another in a somewhat similar way, showing the attitude manufacturers can be forced into because of varying local conditions. Still, it seems that more utilities are willing to push range sales this year than was the case last year.

At the same time, the value of dealer education and dealer sales is being realized to a greater extent, whether there is co-operation with the central-station company or not.

In many quarters manufacturers, distributers and dealers came into this year with large stocks of ranges, and now that these are reported to be pretty well lowered, the manufacturers should come in for a little more business.

Let one case in point be used to illustrate the result of central-station activity in range sales. A leading Mid-Western utility reports that its range sales over the first six months of 1921 were 20 per cent greater than for the entire year of 1920, and that its range connections during that six-month period were 30 per cent greater than for all of 1920. The overlap was due to contractor-dealer sales. It is thought by this company that the contractor-dealers would not have sold 5 per cent of the ranges they did sell had it not been for the educational and sales work of the central-station company.

This fact must not be lost sight of, namely, that sales campaigns put on by central-station companies invariably lead to larger sales by the other branches of the trade. Consequently it would seem to be to the advantage of the range manufacturer to lend every bit of assistance possible to the electric light and power company in seeing that all range salesmen know their subject thoroughly, as it is felt that the crux of the whole situation is personal salesmanship and demonstration. At the same time, dealer salesmen in the same territory should get the same help.

August Electrical Exports Amount to $6,057,489

ALTHOUGH the value of August exports of electrical machinery and appliances was over a million dollars less than that of August, 1920, such figures as are available as to quantities indicate that there has been practically no decrease in the volume of exports. August, 1921, figures are $6,057,489, while August, 1920, returned $7,110,285. Exports for July, 1921, were valued at $6,417,336.

Since March of this year the value of electrical exports each succeeding month has declined only a relatively small amount. March was 28 per cent below February, April 7.8 per cent below March, May 4.8 per cent below April, and June 4.8 per cent below May. July exports fell off 14 per cent below those of June, but August has dropped again, the amount being 6 per cent. Apparently the low part of the curve is being reached.

	August		Eight Months Ended August	
	1920	1921	1920	1921
Batteries	$444,859	$175,878	$4,277,326	$2,986,401
Carbons	174,910	27,110	966,598	304,904
Dynamos and generators	659,200	641,818	4,193,364	5,149,937
Fans	54,911	32,233	860,501	1,161,936
Heating and cooking apparatus	118,817	69,660	1,164,877	1,323,476
Insulating wire and cable	420,208	305,829	4,662,652	7,351,851
Interior wiring supplies	241,425	69,386	2,093,126	1,502,402
Arc lamps	711	184	16,324	8,698
Carbon-filament lamps	2,787	8,051	66,553	112,948
Metal-filament lamps	213,615	86,746	2,512,437	2,738,976
Magnetos, spark plugs, etc.	169,543	71,145	2,393,687	1,063,224
Meters and measuring instruments	152,696	116,820	1,677,969	2,156,510
Motors	845,839	959,773	7,668,715	12,935,073
Rheostats and controllers	30,818	64,456	1,128,295	841,324
Switches and accessories	283,900	184,555	2,766,189	3,510,355
Telegraph apparatus	31,903	26,697	443,341	820,610
Telephones	218,073	321,887	2,348,098	3,810,093
Transformers	721,507	796,292	2,771,693	6,626,943
All others	2,324,563	2,098,969	19,010,332	21,862,158
Total	$7,110,285	$6,057,489	$61,022,347	$76,293,819

A close comparison can be made between the months of July and August of this year. Exports increased in value in August over July on such items as heating and cooking apparatus, arc lamps, rheostats and controllers, telephones, transformers and miscellaneous equipment.

Taking the eight months of this year, the total value of exports comes to $76,293,819; the value over the same period of last year amounts to $61,022,347. Consequently to date this year the value of electrical exports is 25 per cent ahead of the same period of last year, and the rate of exporting for this year is at more than $9,000,000 per month, or about $114,440,000 for the whole year, an increase of over 11 per cent above 1920. But it is probable that during the next four months the value of exports will not increase sufficiently fast to attain this total, as not all the low prices have been represented in these exports. The volume of exports, however, is much further above that of last year than is represented in the figures for values.

Figures in the attached table have been received from the Bureau of Foreign and Domestic Commerce, Washington, D. C.

More No. 14 Rubber-Covered Wire Being Made

THE demand for rubber-covered wire as such is still relatively low, but the demand for Nos. 10, 12 and 14 has been increasing of late. In the case of No. 14, the typical size for lighting-circuit work, the demand has increased not so much for use with rigid conduit or for open-wiring work but for use in flexible armored conductor. This material has been used in increasing amounts for house wiring this year, and in general it has made a larger call on the No. 14 wire, although the larger sizes too have been used.

The reason for the increased demand for Nos. 10 and 12 rubber-covered wire is that larger feeders and circuits are necessary owing to the increasing use of heating and motor-driven appliances.

Telephone extension work has been progressing at a high rate, and this in turn has increased the demand for the size of wire used for that purpose in making the run from the street to the premises.

Metal Market Situation

THE main feature in the copper market is continued firmness of the metal and its general position is considered good. The ruling price in the producers' market has strengthened to 12.37½ cents a pound for electrolytic, delivered, for spot and early October. November is held at 12.50 cents and December at 12.75 cents.

Demand has improved considerably, one large consumer having taken about 5,000,000 lbs. early this week; he is in the market for still more. Consumers are more active in placing orders to take care of late fourth quarter deliveries. The outside market is not getting much of the business placed because of relatively low stocks in these hands.

The outside market likewise feels the strength of the metal and is quoting 12.25 cents at the refinery, which brings the delivered price to above 12.37½ cents for early October. That market is about on a level with the producers' market for the rest of the last quarter year.

Consumers are not satisfied that these prices should rule in October and are offering to buy at figures somewhat below those quoted, feeling that 12.25 cents is enough for October. They realize that there is a coming increase in demand for fall business and are quite desirous of making their own prices at this time.

Late last week the principal lead producer added another 5 points to the price, bringing New York spot to 4.70 cents.

NEW YORK METAL MARKET PRICES

	Sept. 20, 1921	Sept. 27, 1921
Copper	£ s d	£ s d
London, standard spot	67 15 0	68 0 0
	Cents per Pound	Cents per Pound
Prime Lake	12.25	12.25
Electrolytic	12.25	12.37½
Casting	11.75	11.75
Wire base	13.75	13.75
Lead, Am. S. & R. Co. price	4.65	4.70
Antimony	4.45	4.60
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	10.00	10.00
Zinc, spot	4.67½	4.87½
Tin, Straits	26.50	26.75
Aluminum, 98 to 99 per cent	24.50	24.50

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	9.62½—10.12½	9.75 —10.50
Brass, heavy	4.75 — 4.00	4.75 — 5.00
Brass, light	4.00 — 4.25	4.25 — 4.50
Lead, heavy	3.37½— 3.50	3.50 — 3.75
Zinc, old scrap	2.00 — 2.37½	2.00 — 2.37½

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for all Eastern Points

THE outlook for fall buying in the electrical trade is getting a little better each week. No reverses are noted this week, and most of the districts report better business. New York jobbers show a better flow of business, with special emphasis on wiring materials, heating devices and air heaters. Boston business is gradually improving, small orders to the jobbing trade being maintained. Textile, shoe, rubber and metal trades are improving. Motor inquiries are on a better plane in New England, and rubber-covered and weatherproof wires are reacting to a better demand.

Industrial business shows a little more activity in St. Louis, and pole-line equipment for short extensions is moving. Textile mills in the Atlanta district are running strong, farmers are purchasing for cash, and optimism for the fall is running strong.

The Northwest and West Coast States report bumper crops with shipments well under way. In California sales of air heaters, washing machines and electric ranges have been good, and in the Northwest States there has been an industrial revival to a slight degree. Lumber production has been better. The improvement has been noticeable in air heaters, lamps, reflectors and wiring materials for residential work. The Intermountain region has been active in home building, and much of this class of construction is just about ready to provide a market for electrical appliances.

NEW YORK

Jobbers are unanimous this week in reporting better business. As stated last week, orders not only continue to come through in greater numbers but individual orders are for larger quantities of material. Another encouraging sign is the statement by one jobber that he has found it necessary to increase the force in his shipping department to take care of additional business. Further sales of flexible armored conductor in large quantities have been reported, and buying all along the line is of a more confident nature. The demand for wiring materials of all kinds is more active.

Some further improvement was shown this week in heating appliances. Air heaters are beginning to move, and dealers are ordering for immediate and some future delivery. Other heating devices are moving better, with flatirons and toasters showing the most activity.

Most jobbers report collections fair to good, although some state that they still have a number of outstanding accounts. Credit is being extended with a great deal of caution and new accounts are watched very carefully.

Conduit.—Prices on this material remain virtually the same as last week, when new discounts amounting to about a 7 per cent price reduction were announced. Jobbers quoted the following prices: For ½-in. black pipe in 2,500-ft. lots, $54.23 to $55; ¾-in., $69.92 to $70.79, and 1-in., $99.96 to $101.42 per 1,000 ft. Galvanized pipe in the same sizes is quoted at $59.33 to $62, $76.82 to $81 and $110.16 to $116 per 1,000 ft. Demand is fair and jobbers report more activity than last week; however, there is little tendency to large orders. Stocks are fair to good.

Flexible Armored Conductor.—Buying of this material has increased, and several orders for large quantities have been placed, indicating that the trade believes present prices are as low as may be expected. No. 14, two-wire, single-strip, is quoted at $43 per 1,000 ft. in lots of that quantity, and double-strip at $44.50 per 1,000 ft. Jobbers' stocks for the most part are good.

Rubber-Covered Wire.—No change in the price of rubber-covered wire was noted this week, although there is a feeling among jobbers that prices will not go lower. No. 14 rubber-covered is quoted at $6 to $6.16 per 1,000 ft. in 5,000-ft. lots. Stocks are good to large in nearly all sizes.

Outlet Boxes.—New discounts have become effective on outlet boxes. Black boxes in lots of 1,000 are quoted at 57 per cent off list and galvanized boxes in the same quantity at 53 per cent off list. In lots of 100, black boxes are quoted at 55 per cent and galvanized at 50 per cent off list.

Loom.—So far no increase in the price of this material has been announced, although cotton has increased materially. In 1,000-ft. lots the 3/32-in. size is quoted at $19.25 and the ⅛-in. size at $21.

Heaters.—With the cooler weather of the past week there has been some activity in the sale of heaters. Jobbers report that dealers are placing orders for moderate stocks and the outlook is good in this line.

Heating Appliances.—Irons and toasters continue to furnish the most activity among the heating appliances. Other appliances are sluggish—dealers apparently holding off as long as possible before placing orders for holiday stocks. Jobbers' stocks of appliances, other than the two above named, are fair, but manufacturers' stocks are said to be low.

Tape.—Demand is moderate and in line with that for other wiring supplies. In 100-lb. lots friction tape sells for 36c. per lb. and rubber tape for 40c. per lb.

BOSTON

Business is gradually improving, notwithstanding sporadic labor difficulties in the building industry. New building and engineering contracts in New England for the week ended Sept. 20 totaled $2,487,900. Jobbers in the electrical supply field report a well-maintained flow of small orders and some improvement in larger orders placed. Collections are slower in the Connecticut territory but are holding up well at Boston when sharply watched. Jobbers' stocks are widely reduced in most lines. Textile mills in this region are more active and retail trade begins to respond to fall influences. Rubber manufacturers are active and the shoe industry is doing well. The metal-working industries still lag behind others in recuperation, but there is a tendency toward more activity not evident a few weeks ago.

Lamps.—Increased interest in portable lamps and fixtures is noticed and sign lighting is slightly more active. Stocks are ample and prices firm except where close competition in window displays exist.

Motors.—Inquiries are decidedly better this week and many propositions are being figured. One jobber lost a 50-hp. motor order recently because a four-weeks' delivery was quoted instead of a stock shipment. Small-order business prevails, but its diversification warrants close attention to prompt shipment possibilities.

Wire.—The demand is slightly better on weatherproof and rubber-covered, with some movement of bare after long dullness. No. 14 rubber-covered sells at $6.25 per 1,000 ft. in 5,000-ft. to 25,000-ft. lots, prices being open above the latter figure. Weatherproof is moving moderately around 15 cents base and bare is quoted about 14½ cents base. A leading jobber closed a 34 000-lb. order for bare copper wire for central-station line work within a few days.

Flexible Armored Conductor.—In 2,500-ft. lots, No. 14 sells at $45 per 1,000 ft., with fair demand and stocks easily meeting present requirements.

Non-Metallic Flexible Conduit.—Increases in the cost of cotton have not as yet affected the quotations current on this material. Up-country business is fairly active, the 3/32-in. size selling at $17.50 and the ½-in. size at $20 per 1,000 ft. in 5,000-ft. lots.

Washers.—The demand is good, but recent price changes

downward have aroused some complaint that the jobber's margin of profit is less than it should be. The continued high cost of labor combined with vigorous sales effort is moving many machines this fall.

Rigid Conduit.—Prices are easier, and on orders over 5,000 lb. an open market prevails. Representative prices, with good stocks, are: Black conduit, 1-in., $100.58 per 1,000 ft.; ½-in., $54.53; galvanized, 1-in., $110.76; ½-in., $59.63—all under 5,000 lb. The demand is somewhat improved.

Conduit Fittings.—These are moving better. The new price sheets show as follows for representative sizes: Elbows, per 100, 1-in. black, $25.58; ½-in. black, $13.14; 1-in. galvanized, $27.80 per 100, and ½-in., galvanized, $14.28. The corresponding coupling prices are: Black, 1-in., $9 per $100, and ½-in., $4.84 per 100; galvanized, $9.77 for 1-in. and $5.26 for ½-in. per 100.

Transformers.—A more active market on small sizes is reported.

Porcelain Fittings.—Uneasy prices without much change from last week are reported. The market is absorbing larger quantities of this material owing to the moderate increase in building construction and active maintenance work in progress.

ATLANTA

Optimism as regards the outlook for the near future continues, though small-town merchants and bankers state that the money realized from the sale of cotton and other agricultural products is not being applied to any great extent on outstanding debts; rather, the farmers are making cash purchases with the proceeds available to date. The opinion is expressed, however, that this is a perfectly natural situation and that it is only a matter of a short time before the proceeds from cotton will be used extensively to cancel outstanding obligations and this will start a general revival of business in this section. All of the textile mills are back on full time with some operating double shift. Electrical supply jobbers report their business as showing a reasonable increase over the past two weeks, the increase, however, being spasmodic, each little peak being slightly in excess of its predecessor. Large numbers of small orders are being received daily, and the small purchasers, contrary to the usual custom, are asking for quotations before placing firm orders for material. Several very attractive orders have been received during the past week from industrials, and buying by industrials and municipal plants continues to increase, most of the purchases being for maintenance purposes. Collections are showing improvement, and jobbers report most of their credit sales on the sixty-day basis.

Meters.—The policy of the small plants in abolishing flat-rate service has caused a very brisk demand for the popular-size meters. One of the largest jobbers estimates that 90 to 95 per cent of orders received are for the two-wire, 5-amp. type. Stocks in this line are somewhat low but are being replenished by good shipments.

Lamp Cord.—Jobbers are placing comparatively heavy orders to replace depleted stocks. Retailers report the movement satisfactory with no change in price for the past two weeks.

Panelboards.—Several heavy orders were reported last week, most of the sales going to motion-picture houses and theaters that are nearing completion. Sales to apartment houses, office and commercial buildings, however, are slow.

Storage Batteries.—This line reflects the increased business in the rural districts and respectable orders are being received. The increase in number of automobiles throughout the section and the return to use of numbers of machines that have been laid up is strengthening the market. Some manufacturers have made sharp reductions in prices.

Oil Switches.—This line, together with equipment for industrial plants, has not shown any noticeable activity of late. Stocks are plentiful throughout the section.

Conduit.—The past thirty days have witnessed the best movement in this line for the last six months, the movement being particularly brisk in the smaller sizes, especially 1-in. galvanized and black. All sizes are on hand in quantity with the exception of 1-in., stocks of which have bcome depleted in some localities. A price reduction of 4 per cent was noted last week.

Schedule Material.—This seems to be on a little firmer basis than two weeks ago, though taken as a whole it is not showing the activity that should be expected of it. A slight price reduction in certain lines was announced last week.

Cross-Arms.—Carload lots are moving very satisfactorily, but there is a shortage of orders for less-than-carload lots. Pine arms show a price reduction of 5 per cent, but fir arms are steady. Heavy stocks are on hand.

Inter-Phones.—This line is rather sluggish, such orders as are being received calling for the cheaper class of material. No price change of recent date is to be noted and stocks are in good shape.

ST. LOUIS

Although a large number of factors tending to affect the development of electrical sales here have been noticed, the net result of last week's business was about the same as that for several weeks past. The buying by municipal plants, which was fairly active for some time, shows a tendency to slow down. Industrial business, on the other hand, shows improvement, particularly in St. Louis, where it has been very quiet for several months. Several sales of engine-generator sets to out-of-town plants have been made. The utility companies are purchasing rather large amounts of poles, transformers, lightning arresters and meters for use in short extensions. Appliances show steady increases in sales. Inquiries are becoming more numerous and for more attractive amounts, and it is generally believed that business will continue to show a steady, though slow, improvement.

The metal industry, which had been very stagnant, shows substantial improvement. Planing mills and furniture factories are running somewhat heavier. Owing to the better condition of credit, the principal buying is being done by Illinois, Missouri and Iowa. Some improvement is noticed in the South, particularly Kentucky, but no change can yet be directly attributed to the improved cotton market. Considerable attention is being given by the manufacturers to the development of the Mexican trade.

Conduit.—Following the four-point increase in discounts some concerns are making special prices on the ½-in. size, the black being priced at $51 per 1,000 ft. and the galvanized at $56, both in bundle lots of 100 ft. Sales are slightly better, and stocks, with a few exceptions, are in good shape.

Wire.—With the expectation of a stiffening in wire prices there has been some improvement in sales. No. 14 rubber-covered is slightly lower in 5,000-ft. lots, the price being $6.25 per 1,000 ft. The price remains at $6.10 in 10,000-ft. lots. No. 6 double-braid stranded is quoted at $33.66 per 1,000 ft. in 5,000-ft. lots. The base price on bare and weatherproof varies from 14½ cents to 15 cents per pound. Stocks are in satisfactory condition.

Street-Lighting Cable.—There has been a fair demand, but municipalities are somewhat slow in making extensions. No. 8 solid single-conductor, 3,500-volt, is quoted at $140 per 1,000 ft., f.o.b. factory.

Lighting Standards.—Inquiries are being received in sufficient volume to indicate a desire to expand lighting systems, but because of existing tax rates it is proving difficult to have the necessary bonded indebtedness voted.

Lamp Cord.—Very little improvement in demand is reported, though the stocks are getting more in line. No. 18 cotton-covered generally sells for about $13 per 1,000 ft. in 5,000-ft. lots, and silk-covered ranges from $23 to $25 per 1,000 ft.

Air Compressors.—Good sales for the garage type are reported, and there is an improving demand for all stationary motor-driven machines. The portable compressors, however, are moving slowly.

Hammers and Drills.—A substantial improvement in sales is reported, particularly in southern Illinois, due in part to

more construction work and also to increasing demand around the mines.

Pole-Line Material.—Inquiries that are being made indicate some improvement in demand within the next thirty days, but there has been a slackening in sales for the past two weeks. Most of the inquiries are for comparatively small amounts.

Transformers.—Central-station companies are making larger purchases to take care of the coming lighting loads and, to a lesser extent, to serve new industrials. Orders for transformers to serve small outlying towns are being obtained from a number of the utilities.

Meters.—Coincident with the improved transformer business, the demand for meters shows steady improvement. The residential lighting type is finding a particularly good market.

Lightning Arresters.—Sales of compression-type arresters continue in good volume. Better sales are also reported for substation installations by the larger power companies.

SAN FRANCISCO

Conditions, especially in the coast and interior valleys, are very prosperous, and one of the hottest seasons ever known following a spring of good rainfall is producing bumper crops. Moreover, the crops which were left over from last year are now being sold. The usual series of county fairs is in progress, and electrical men have taken care to have good representation. An electrical feature of these fairs is the number of electric range booths with capable salesmen and demonstrator in attendance. Farm plants are also featured. The oil production is seriously threatened by a strike now in progress in the Kern County fields. San Francisco and Oakland are fast recovering from the sixteen-week builders' strike, which resulted in a victory for the American plan.

Fans.—With the fan season now virtually closed, jobbers and dealers report the best season in many years, the main factor being a summer which, while it did not break any high heat records, was yet unusually hot for a long period. Stocks of all kinds are reduced to a few odd left-overs.

Radiators.—A few days of cold rain gave considerable impetus to radiator sales, but as yet the season has not really started. Jobbers have placed their orders as a basis for manufacture, and so far these advance orders have run pretty close to last season's orders, notwithstanding considerable unsold stock from last season.

Heating Material.—Iron sales are rather slow, notwithstanding that some companies have guaranteed present prices until Jan. 1. The heaviest overstock item is percolators, and Christmas holdovers are still mostly unsold. There is a good call in proportion for complete percolator outfits.

Washers.—Dealers from all sections of the state are reporting a 300 or 400 per cent increase in washer sales. There is a tendency to decrease the number of types and makes carried by dealers, although hand in hand with this tendency is an apparent standardization of the practice of carrying at least two contrasting styles.

Ranges.—The range campaign of the Great Western Power Company, based upon sales virtually at cost, has resulted in a sale of more than 100 heavy-duty pieces in the last couple of months. The Pacific Gas & Electric campaign, which is to be based upon dealers' participation, is still in process of organization.

SEATTLE—PORTLAND—SPOKANE

There is a continued feeling of optimism over the general business outlook throughout the Northwest generally. This feeling prevails in the electrical industry as well on the part of manufacturer, jobber and dealer. Increased shipping movement of crops, renewed activity in the lumber industry and a slight industrial revival are pointed to as tangible evidence of better times. Lumber production in Oregon and Washington for the week ended Sept. 17 was 20 per cent below normal. New business booked was about 10 per cent in excess of the cut and about 30 per cent in excess of the shipment. More cargo is being offered at the port of Portland than can be handled, particularly in lumber and grain, and imports are on the increase.

Electrical jobbers of Portland report a reduction of about 5 per cent in conduit prices. Bare copper wire is now selling on a 15½-cent base. Wiring devices and material are the most active at the present time, although lamps, reflectors and air heaters are showing marked improvement. Seattle jobbers see some improvement in sales—September is better than August and money is a little easier. Credits have improved slightly, but collections are still difficult to make and stand at from fifty-five to sixty days as compared with a normal period of perhaps forty-five days. Residence wiring is holding up well, but industrial business is not so good.

Portland reports credits apparently loosening and collections somewhat improved. Long-standing accounts are still in bad shape, but new accounts are being handled in a very satisfactory manner. Jobbers of Spokane report continued better business and anticipate a good fall. Stocks are ample and shipments are prompt. A car of high-tension insulators, a car of farm-lighting plants and a car of ranges are on the road, with a second car of ranges to be shipped soon. The territory around Spokane is absorbing more than a carload of ranges a month. Residence construction is active, many homes being wired during construction for electric ranges.

Contractor-dealers of Portland report the number of orders taken as materially greater than a year ago, although the volume of business does not show such an increase. Contractors have been buying short for so long because of the fall in prices that stocks are in a very depleted condition at the present time, and they are more actively in the market than they have been for several months past.

Wire.—Seattle quotes No. 14 rubber covered at $6.50 and No. 12 at $8.80 per 1,000 ft. in 5,000-ft. lots, with demand fair and stocks heavy.

Flexible Armored Conductor.—Demand is fair and stocks are in good shape. No. 14, 2-wire single and double strip, sells at $56.33 per 1,000 ft. in 2,500-ft. lots.

Knobs and Tubes.—Nail-it knobs are $21.60 per 1,000 in barrel lots and ⅞-in. tubes are as follows: 2½- and 3-in., $7.74, and 4-in. $10.08, all per thousand in barrel lots.

Tape.—Demand is fair and stocks ample. Friction tape is quoted at $21.70 per 100 rolls and rubber at $19.44 in 200-roll lots.

SALT LAKE CITY—DENVER

The fall weather thus far has proved ideal for builders, and contracts are being pushed rapidly to completion. Hundreds of residential buildings will soon be in the market for prospective home owners, and the housing problem will be far less acute this winter than last. Excessively high rents are in part responsible for the persistent lack of buying activity. A new three-million-dollar hotel is projected for construction in Denver in the near future. The tourist traffic has been a saving factor for the Intermountain West. Denver in particular has been able to exploit this passing trade to a very profitable degree. Retailers report that their summer volume of sales compares favorably with corresponding business for the season of 1920.

Aid which the War Finance Corporation will be able to give Western stock growers will enable them to preserve their herds intact for winter fattening on feed that is cheaper than it has been in years. With a favorable winter they should be able to liquidate next spring and summer to good advantage. Wire mills report a better demand for their product. It is believed that prices on wire have about hit the bottom, a small reduction having been made within the past month.

Lamps.—Lamps are showing the usual September activity. Householders are buying in a steadily larger volume. Stocks are ample.

Air Heaters.—From present interest shown dealers expect a fair trade in this item. They are ordering in better quantities.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Western Electric Sales Nearly Up to Last Year's

Charles G. Du Bois, president of the Western Electric Company, has issued the following statement in connection with the 1921 business of that company:

"The Western Electric Company reports sales for the eight months ended Aug. 31 as approximately $122,000,000, or almost the same as for the similar period of 1920. Since the beginning of the year the company has reduced its floating debt by $7,500,000 and has increased its cash balance by $6,000,000, an improvement of $13,500,000 in its financial position."

Electric Machinery Company Opens New York Office

Following its purchase and reorganization last April, the Electric Machinery Manufacturing Company, Minneapolis, Minn., has started again the expansion of its distribution. To this end a New York office was opened early in September in the Grand Central Palace, Forty-sixth Street and Lexington Avenue, in charge of A. B. King, who was sales manager for the old Electric Machinery Company. Plans are under way to open offices as soon as practicable in the same cities where representation was held before.

Under the new ownership Silas McClure is president, and in a recent announcement he states that his company's prices on electrical apparatus are now closely comparable with 1914 prices. "Whatever decline may occur to reach that level promises to cover an extended period," he continues. The company specializes in the manufacture of synchronous motors and vertical alternators.

Rapid Turnover Discussed in U. S. Chamber of Commerce Booklet

"Merchandise Turnover and Stock Control" is the title of a booklet being distributed by the Domestic Distribution Department of the United States Chamber of Commerce, Washington, D. C. Therein is brought out the advantages of rapid turnover in business, and this fundamental principle of merchandise is emphasized in connection with a suggested plan of stock control records designed to reduce waste and losses which are due to slow movement of goods.

The department calls attention to seven separate directions in which losses may occur when merchandise is not turned over as rapidly as it might be. These are investment, interest, markdown, salaries and wages, shelf and storage room, prestige and reputation, and inefficiency, all of which the booklet takes up in detail. Two graphs help to bring home the points made.

Apex Adds Gould Ironer to Its Appliance Line

The Apex Electrical Distributing Company, Cleveland, announces its purchase of the Gould ironer, which it will manufacture hereafter under a new name in connection with the Apex electric suction cleaner and the Rotapex electric clothes washer.

The Gould ironer was the product of the Gould Appliance Company, New York City, and Benjamin Gould, president of the Eastern company, has joined the Apex organization in Cleveland to supervise the sale of the ironer.

With better factory facilities this ironer, it is announced, will be a greatly improved product, and the Apex Electrical Distributing Company plans to push its sales vigorously.

William F. Clarke to Represent M. W. Dunton in New York

The William F. Clarke Company, Singer Building, New York City, has been appointed exclusive representative of the M. W. Dunton Company, Providence, R. I., in the metropolitan territory, handling its lines of soldering flux known as "Nokorode," which is put in three forms, paste, salts and liquid, and also its "Red Rope Paper" for armature winding. The Clarke company is also considering taking on other lines in the near future. Stocks will not be carried at this address unless at some future time conditions should warrant it.

Mr. Clarke previously represented the Square D Company in New York and in Baltimore territory. He started in the electrical field with the Manhattan Electrical Supply Company, where he spent five years as assistant manager at the Forty-Second Street branch, New York City.

Manufacturer Sought to Make Canadian Dishwasher

The "Cosmo" Electric Company, 60 Bedford Row, Halifax, N. S., in issuing a folder on its "Cosmo" electric dishwashing machine, adds a request to be placed in communication with manufacturers who are in a position to make this machine for Canada or the United States.

Enlarged Organization and Capitalization of Jewell Electrical Instrument Company

Following out its policy of working carefully, conservatively and progressively, the Jewell Electrical Instrument Company, 1640 Walnut Street, Chicago, last May came to the point of development where with the increased demand for its instruments the company found it to its advantage to increase capitalization and enlarge its organization. The capitalization was increased to $150,000, all subscribed and paid in.

For the past twelve years Orval Simpson, president of the company, and Ray Simpson have held all the stock in the company, but on its increase in capitalization, although they still retain a very substantial control of the stock, a small portion has been sold to a few of the company executives. A. F. Klink, president of the Bryant Zinc Company, Chicago, a stockholder has been elected a director and also the treasurer of the Jewell Electrical Instrument Company.

Orval Simpson states that while his production is not back to normal, he is encouraged in that each month of this year has shown a conservative and continued increase in the volume and number of orders booked, and he feels that conditions are improving on a healthy and substantial basis.

New Plant for the North American Electric Lamp Company

The North American Electric Lamp Company, St. Louis, is erecting a new one-story factory containing 20,000 sq.ft. of floor space for the manufacture of carbon lamps. The machinery, which is now being installed, is reported to be of the most modern design, and the filament-treating equipment was designed by the company's own electrical engineers. Special care has been taken to obtain unusual efficiency in the exhausting machinery. The plant when completed will give employment to about a hundred hands.

Manufacturers Talk to Wetmore-Savage Men

A vigorous and well-attended sales conference was held at Boston Sept. 22-24, under the auspices of the Wetmore-Savage Company, electrical supply jobbers. In addition to business sessions at the Exchange Club, the conference also attended the exhibit of the Bureau for Better Illumination, in one of the old Massachusetts Institute of Technology Buildings. Among the speakers at the sales conference were: E. L. Bradbury, Holophane Glass Company; H. C. Bingham, Diamond Holfast Rubber Company; J. S. Lapp, Lapp Insulator Company; A. G. Kimball and C. F. Smith, Landers, Frary & Clark; R. V. Bingay, Pittsburgh Transformer Company; Warren A. Myers, Chief Engineer Stewart and W. W. Mumma, Robbins & Myers Company; George A. Burnham, Condit Electrical Manufac-

turing Company; Warren M. Heim, Hubbard & Company; G. V. Ingham, Bryant Electric Company; N. B. Missel, American Ever Ready Works; J. R. Wilkins, Economy Fuse & Manufacturing Company; J. H. Trumbull and L. L. Brastow, Trumbull Electric Manufacturing Company; Bon Clark, Brokaw-Eden Company; F. V. Burton, Henry D. Sears; M. Corcoran, Stanley & Patterson; R. C. Lanphier, Sangamo Electric Company; C. S. Beardsley, Apex Electrcial Distributing Company; K. S. Byrd, Manhattan Electrical Supply Company; W. H. Talkes, National Carbon Company; J. Patrick and Messrs. Johnson and Jensen, the Benjamin Electric Manufacturing Company, and Mr. Sullivan, Bryan-Marsh Company. That good sales will reward continued hard work was the general view expressed.

Pacific Radio Trade Association Formed to Help Amateur

With a slogan of "Better service to the radio amateur," the Pacific Radio Trade Association has been organized, with headquarters at San Francisco. Membership includes radio manufacturers, jobbers, dealers and advertisers. The prime purpose of the association, it is declared, is a co-operative effort to popularize the use of radio, and the first step in this direction will be a joint exhibit and demonstration of radio equipment at the California Industries Exposition, Nov. 19 to Dec. 20.

Arthur H. Halloran, editor of *Radio*, is president; Ellery W. Stone, Pacific Radio Supplies Company, is vice-president; Max Lowenthal, Globe Commercial Company, is secretary-treasurer. District No. 1 of the association comprises the northern part of California and Nevada; district No. 2 takes in the southern part of California, which is now in the process of organization; district No. 3 comprises Oregon and Washington, and District No. 4 takes in Utah and Idaho. Organization of these last two districts will be completed in the near future.

Export Convention to Have Large Foreign Representation

Plans are about completed for the twelfth annual convention of the American Manufacturers' Export Association, which will be held on Oct. 5 and 6 at the Waldorf-Astoria in New York City. It is expected that several of the recently appointed chiefs of the commodity divisions of the Bureau of Foreign and Domestic Commerce will be in attendance with whom manufacturers may discuss the sale of their products in foreign countries. The general theme of the convention is "How to Retain and Increase Export Trade."

An interesting feature will be the opportunity manufacturers will have of meeting representatives of foreign countries, thirty-one of which have sent trade ambassadors to advise regarding trade possibilities in their respective lands. Among the nations which will be so represented are Argentina, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Cuba, Czecho-Slovakia, Dominican Republic, Ecuador, Finland, Great Britain, Greece, Italy, Netherlands, Netherlands Colonies, Nicaragua, Norway, Poland, Persia, Peru, Philippine Islands, Salvador, Spain, Uruguay, Venezuela, Guatemala and Mexico.

"Problems of Exchange" has been assigned to Allen Walker, manager foreign trade bureau of Guaranty Trust Company. W. S. Kies, chairman of the board, First Federal Foreign Banking Association, will discuss "Foreign Credits and Investments." W. F. H. Koelsch, president National Association of Credit Men; J. S. Lawrence of Lawrence & Company, Boston, and Benjamin M. Anderson, Jr., Chase National Bank, New York, will discuss "Our Relation to the Present European Situation."

John H. Fahey, Boston, will speak on the "International Chamber of Commerce." Julius Klein, director of the Bureau of Foreign and Domestic Commerce, will speak on the work of that bureau. Judge John F. Zoller, General Electric Company, and Thomas J. Doherty, National Council of American Importers and Traders, Inc., will discuss "The Effect of the Tariff on Export Trade." Lawrence Langner, patent and trade-mark counsel of the association, will speak on "Competing for Foreign Trade With Trademarks." The evening of Oct. 6 has been set aside for the annual banquet.

United Lamp Penalizes Maker of Defective Lamps

The United Lamp Manufacturers' Corporation, 44 West Eighteenth Street, New York City, which opened for business on Aug. 1, has adopted a policy not only of guaranteeing its lamps but also of penalizing the manufacturers whose defective lamps may get into circulation through oversight of inspectors. The corporation was formed by eleven independent lamp manufacturers as a selling, distributing, purchasing and manufacturing control organization, to supply a complete line of incandescent lamps in uniform packing and of uniform high quality.

At a meeting of the factory managers on Aug. 8 A. E. Wiest, president of the corporation, said that it would be necessary to have the product up to the standards adopted by the middle of September as the uniform line of cartons would be ready for use at that time. As a matter of fact those cartons will not be ready until early in October, owing to a delay in printing. "After that time," said Mr. Wiest, "no lamps will be permitted by our inspectors to be packed in 'United' cartons that do not meet the tests required to insure a 'quality lamp.' On any lamps that upon delivery to our customers do prove defective you will be penalized 10 per cent of their value. If we do not make quality, we will not make lamps. An extra allowance of 10 per cent will be made to our jobbers on all 'United' lamps returned which inspection shows were actually defective in manufacture."

The last clause seems to protect the jobber for his trouble in handling complaints on defective lamps.

Oil Circuit Breakers for 220,000-Volt P. G. & E. Line

Announcement is made of further orders of electrical equipment for use on the 220,000-volt lines of the Pacific Gas & Electric Company. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, is to supply six high-tension oil circuit breakers for this solidly grounded system.

G. E. Announces Further Pay Roll Reduction

Another reduction of 10 per cent in wages and salaries affecting all employees has been announced by the General Electric Company to take effect on Oct. 31. The announcement by E. W. Rice, Jr., president of the company, follows:

"In accordance with an order of the board of directors, a reduction of 10 per cent will be made as of Oct. 31, 1921, in the salaries of all officers and employees of the company. Heads of departments are requested to notify all those affected."

The General Electric Company has made several reductions since last January. The first reduction became effective Feb. 1, when the wages of day workers at the Schenectady plant were reduced 10 per cent and the pay of piece workers 10 per cent. The bonus system was also dropped.

In July another reduction of 10 to 30 per cent was announced. The working forces have been reduced in line with the company's plan of retrenchment.

The Southern Electrolyte Battery Company, New Orleans, La., has acquired a local building which it will remodel and equip for the manufacture of electric storage batteries.

The Ojax Battery Company, Canaseraga, N. Y., is planning to erect the second unit of its new electric battery manufacturing plant. The first unit has been completed and machinery will be installed at an early date.

The Midstates Engineering Company, Westminster Building, Chicago, has the agency from the Brown-Boveri Company, Baden, Switzerland, for the United States.

The J. T. Pearson Company has taken new quarters at 624 Dime Savings Bank Building, Detroit, where it has more spacious quarters. The company represents the United States Rubber Company, wire division; Central Tube Company, National Electric Porcelain Company, and the Steel City Electric Company.

The Oregon Insurance Rating Bureau, Portland, Ore., has issued the fifth edition of "Wiring Data for Direct and Alternating Current Motors," which supersedes all previous editions.

Foreign Trade Notes

GENERAL ELECTRIFICATION OF ITALIAN RAILWAYS UNDER WAY.—Work is proceeding actively on the general electrification of the Italian railways. At the end of August, 1920, ten roads, comprising a total of 797 km., had been equipped for electrical operation. From Sept. 1, 1920, to June 30, 1921, five additional roads, comprising a total of 234 km., were electrified. During the current year 434 km. of road will be electrified. At the end of August, 1920, the sole electric generating plant operated by the railways of the state was that of Mordegno, with a capacity of 5,000 hp. and normally working with about 3,800 hp. Various works have now been started and are being carried on and finished by means of designs and contracts approved recently by the second section of the Superior Council of Waters, and these will soon be submitted for the financial approval of the Council of Administration of the railways.

ESTABLISHMENT OF HYDRO-ELECTRIC PLANTS IN MEXICO.—The Mexican authorities, according to reports from Commissioner R. M. Connell, have for some time offered inducements for the establishment of hydro-electric plants in or near the Federal District, the plant of the existing power company being inadequate for the needs of the territory. A decree has been issued reducing federal taxes on the use of water for power and irrigation, and the press announces that two Mexicans have submitted a proposal for the erection of such a plant.

H. R. FORBES MACKAY, general manager of the municipal electricity department of Sydney, New South Wales, Australia, according to the *Electrician*, has been instructed by the City Council to visit Great Britain and America for the purpose of making investigations of the latest developments in electric generating and distributing systems. Mr. Mackay expects to arrive in London about the middle of October, where he will make his headquarters at the office of Preece, Cardew & Rider, 8 Queen Anne's Gate. The Sydney electric power project is a large undertaking, the capital expenditure being already nearly £4,500,000. Mr. Mackay has reported to the City Council that the next generating unit to be installed should be of about 16,000 kw., that it will take all the space available in the present power house, and that by 1925 a new power house should be in operation. It is largely in connection with the design of this proposed power house that Mr. Mackay is making his visit to Great Britain and America. He is especially interested in pulverized coal as fuel, automatic protection of high-tension cables, the latest developments of automatic stokers, steam turbines, use of extra-high steam pressures in boilers and methods of disposing of ash and clinker where coal is burned in large quantities.

HYDRO-ELECTRIC PROJECTS IN NETHERLANDS EAST INDIES. — While good progress is being made on hydro-electric projects in the Netherlands East Indies, new projects for further development of water power, according to *Eastern Engineering*, continue to be launched. Work on a 37,500-kw. power project in the Residency of Batavia, it is stated, was started last year. It is proposed that power shall be supplied from this station for operating the Batavia railway and furnishing electricity for light and power to the towns which the railway serves, including Tandjong, Priok, Batavia, Meister Cornelis, Buitenzorg and Soekaboemi. A plant is under construction in the Preanger Regencies to have an initial capacity of 2,475 kw. An additional reservoir is to be constructed so that the output of this station may be doubled. A power station is to be erected on a tributary of the Tjisadana, to the west of Buitenzorg, to develop between 18,650 kw. and 21,000 kw.

PROPOSED MANUFACTURING PLANTS IN AUSTRALIA.—The question of establishing plants for manufacturing electrical machinery in Australia is being actively discussed, according to information furnished by Vice-Consul Fox at Melbourne, Australia. In discussing the feasibility of establishing factories of this kind in Australia, the newspapers point out that during the month of July equipment in connection with the Morwell central-station distribution project, amounting to about £1,500,000, was ordered from America. One of the companies mentioned as intending to establish large works in Australia is the English Electric Company of Australia, Ltd., which announced plans some time ago. The Commonwealth General Electric Company, Ltd., has recently announced that it will erect large works immediately at Spotswood, in Melbourne, for the manufacture of electric line equipment and other equipment ranging from steam turbines to small switches and including magnetos, storage batteries, electric furnaces, radio equipment, etc.

New Apparatus and Publications

ELECTRIC WASHER. — A springless oscillating-type washing machine is being marketed by the United Engine Company, Lansing, Mich.

POLYPHASE INDUCTION MOTORS.—Bulletin No. 1,118 issued by the Allis-Chalmers Manufacturing Company, Milwaukee, describes its new line of continuous-rated polyphase induction motors, including the type AR squirrel-cage line, which is now on the market, and its new type R potential starter.

ELECTRICAL INSTRUMENTS. — The Jewell Electrical Instrument Company, 1640 Walnut Street, Chicago, is distributing two circulars, one covering instruments for use in garages, battery and automobile service stations, and the other showing a new line of electrical instruments especially applicable to radio apparatus and supplies.

HYDRAULIC TURBINES.—The Worthington Pump & Machinery Corporation, 115 Broadway, New York City, is distributing bulletin No. 1, series 1, describing its different types of hydraulic turbines.

ELECTRIC VEHICLES.—The Ward Motor Vehicle Company, South Fulton Avenue, Mount Vernon, New York, is distributing a booklet entitled "Are You Willing to Face the Facts on Delivery Costs to Save 20 per Cent to 35 per Cent?", covering the use of electric motor vehicles for delivery service.

WASHING MACHINES.—The Woodrow Manufacturing Company, Newton, Iowa, has issued a leaflet describing the improved "Woodrow" washing machine.

ELECTRIC WASHING MACHINE.—The Voss Brothers Manufacturing Company, Davenport, Iowa, is distributing a leaflet describing the new Voss "Sea Wave" model B washer.

TOGGLE SWITCHES.—Bulletin No. 17-3 issued by Harvey Hubbell, Inc., Bridgeport, Conn., describes the "Hubbell" toggle switches with luminous tips.

WEIGHT CARDS.—The American Sheet & Tin Plate Company, Frick Building, Pittsburgh, has issued a new and revised set of weight cards covering black sheets, galvanized sheets and formed products.

PLATINUM. — Baker & Company, Inc., Newark, N. J., has issued the fourteenth edition of "Data Concerning Platinum."

FUEL-OIL ENGINES. — The Hadfield-Penfield Steel Company, Bucyrus, Ohio, has issued two catalogs describing and illustrating its Diesel-type horizontal and vertical standard fuel-oil engines.

New Incorporations

THE SAYLORSBURG (PA.) LIGHT & POWER COMPANY has been chartered under the state laws with a capital stock of $20,000 to operate an electric light and power system in that vicinity. Frank D. Shupp, Saylorsburg, is treasurer.

THE SIMPSONVILLE (KY.) LIGHTING COMPANY has been incorporated with a capital of $3,000 by W. P. Johnson, A. S. Frazier and W. C. Lyons, all of Simpsonville.

THE MECHANICAL & ELECTRICAL MANUFACTURING COMPANY, Bethel, Me., has been incorporated with a capital stock of $100,000 to manufacture and deal in electric water heaters, electric wiring rosettes, other devices and appliances for heating, etc. The directors of the company are Theodore Morin, Berlin, N. H., president and treasurer; Charles D. MacLean and Peter E. Lemieux, Berlin, N. H.

THE CITIZENS' LIGHT & POWER COMPANY, Chrisney, Ind., has been incorporated by J. F. Bergman, L. E. Bays, S. F. Tower and B. F. Huffman, to furnish electricity for light, heat and power.

THE MARKOE & WALLACE ELECTRICAL COMPANY, New York, N. Y., has been chartered with a capital stock of $5,000 to manufacture and deal in electrical equipment. The incorporators are R. Markoe, H. W. Wallace and F. J. Ashley. The company is represented by A. Males, 366 Broadway.

THE SHAMOKIN, ELDRED, CAMERON, RALPHO and ZERBE ELECTRIC COMPANIES, Allentown, Pa., have been chartered under the state laws with a capital stock of $5,000 each, to install and operate electric systems in Northumberland County. The companies are all controlled by the same interests. Among the incorporators are C. M. Walter, J. S. Wise, Jr., and L. K. Bingaman, Allentown.

THE GAS-ELECTRIC APPLIANCE COMPANY, Brooklyn, N. Y., has been incorporated with a capital stock of $20,000 to manufacture electrical and gas equipment and appliances. The incorporators are E. J. and T. E. Byrne and L. P. Doyle. The company is represented by Cullen & Dykman, 177 Montague Street.

THE HOBOKEN (N. J.) LIGHTING FIXTURE & SUPPLY COMPANY, 614 Washington Street, has been organized to manufacture electric lighting fixtures and kindred equipment. Benjamin Johns heads the company.

THE ELECTRIC AMUSEMENT COMPANY, Trenton, N. J., has been incorporated by Lehman H. Garrison and William C. Matlack, Trenton, and Henry S. Wilson, Jr., Philadelphia, Pa. The company is capitalized at $125,000 and proposes to manufacture electrically operated amusement devices.

THE KING RADIO COMPANY, Pittsburgh, Pa., has been incorporated with a capital stock of $10,000 to manufacture radio apparatus. The incorporators are E. W. T. King and G. H. Sharman, Pittsburgh, and M. W. Palmer, Wilkinsburg.

THE MYRON BURGLAR ALARM COMPANY, Louisville, Ky., has been chartered with a capital stock of $10,000 by Louis Isaacs, Jacob Landau and S. J. Levy.

THE BETTERTON (MD.) ICE & POWER COMPANY has been organized with a capital of $200,000 to operate an electric light and power plant for commercial service in Betterton. The company also proposes to build an ice-manufacturing plant. John Brice is interested in the company.

THE HOLT POWER-LIGHT COMPANY has filed articles of incorporation under the laws of Delaware with a capital stock of $2,000,000 to manufacture farm-lighting power plants. The incorporators are M. L. Rogers, L. R. Wilson and M. M. Nichols, Wilmington, Del.

THE RADIO SERVICE LABORATORIES have been chartered under the laws of New Jersey with a capital stock of $50,000 to manufacture equipment. The incorporators are Hobart A. Simpson, Ocean Grove; Harold M. Lewis, Long Branch, and Melvin S. Moore, Manasquan.

THE EVERETT (MASS.) ELECTRICAL COMPANY has been incorporated with a capital stock of $50,000 to manufacture and deal in electric appliances. The incorporators are Roy C. Blackburn, Milton; Michael F. Culliney, Dorchester, and H. M. Clifford, Arlington.

THE QUID MANUFACTURING CORPORATION, Bay Shore, L. I., N. Y., has been incorporated by W. S. Johnson and M. J. Bunce to manufacture engines, motors and kindred products. The company is capitalized at $1,000,000.

THE TAYLORSVILLE (KY.) ELECTRIC COMPANY has been chartered with a capital stock of $16,000 to supply electricity for light and power in Taylorsville. The incorporators are H. W. and C. Mayfield, Ludlow, and F. S. Mayes, Springfield

THE STAR MACHINE & NOVELTY COMPANY, Bloomfield, N. J., has been incorporated by John Brach, John Cionek and Anthony E. Zaga, 77 Mill Street. The company is capitalized at $100,000 and proposes to manufacture electric motors and parts and other machinery.

THE EXCELLIGHT COMPANY, Bristol, Conn., has been incorporated with a capital stock of $25,000 to manufacture electric lamps and kindred products. The incorporators are Rudolph Stern, F. N. Manross and Hjalmar Geruldsen, 28 Merriman Street.

THE ALMA ELECTRIC & SUPPLY COMPANY, Los Angeles, Cal., has been chartered with a capital stock of $75,000 to manufacture electrical products. The incorporators are A. E. Westphal, Iver J. McAllister and Joseph O. Poole.

Record of Electrical Patents

Notes on United States Patents

(Issued Aug. 30, 1921)

1,389,124. SUPPORT FOR THIRD RAILS; T. W. Casey, Yonkers, N. Y. App. filed June 6, 1917. Simple and inexpensive.

1,389,126. ELECTRICAL PRECIPITATING SYSTEM; Lewis W. Chubb, Edgewood Park, Pa. App. filed Jan. 5, 1917. For precipitating finely divided matter from gases of vapors.

1,389,134. MANUALLY OPERATED CIRCUIT-CROSSING SWITCH; John B. Grosswege, Wilkinsburg, Pa. App. filed Aug. 15, 1918. Electric coupler of the butt type.

1,389,137. CONTROLLING DEVICE FOR BRUSH-HOLDER MECHANISMS; Max E. Gysel, Wilkinsburg, Pa. App. filed Nov. 7, 1917. Single-phase motors of commutator type.

1,389,147. AUTOMATICALLY CONTROLLED VAPOR-CONVERTER SUBSTATION; William V. Lovell, Wilkinsburg, Pa. App. filed Oct. 3, 1917. No operator required.

1,389,148. TRANSFORMER; William M. McConahey, Pittsburgh, Pa. App. filed June 8, 1917. Insulation subjected to uniformly distributed electric stresses.

1,389,149. INSULATING COIL AND METHOD OF MAKING SAME; Jesse E. Mateer, Wilkinsburg, Pa. App. filed Sept. 1, 1917. Good insulating properties and smooth external surfaces.

1,389,150. SYSTEM OF CONTROL; Harry R. Meyer, Wilkinsburg, Pa. App. filed Oct. 17, 1918. Railway system adapted for operation from two different supply voltages.

1,389,165. ELECTRIC HOT-AIR HEATER; O. P. Scott, Tacoma, Wash. App. filed Sept. 1, 1920. Installed beneath floor similar to radiator of an hot-air furnace.

1,389,166. WATER HEATER; Oliver P. Scott, Tacoma, Wash. App. filed Sept. 25, 1920. For use in domestic tank.

1,389,174. STORAGE BATTERY; Grant Wheat, Marlboro, Mass. App. filed Aug. 6, 1919. For lighting lamp on miner's cap.

1,389,192. HEATER AND HEAT INSULATION; William S. Hadaway, Jr., New Rochelle, N. Y. App. filed July 26, 1917. Vapor electric heaters.

1,389,230. THERMIC TELEPHONE; Robert Aernout Baron van Lynden, Utrecht, Netherlands. App. filed Oct. 12, 1917. Manufacture of heating conductors greatly facilitated.

1,389,235. ELECTRIC DEVICE; J. D. Zieley, Summit, N. J. App. filed Dec. 20, 1918. Heater adapted for use in connection with electric fan.

1,389,242. THERMIC TELEPHONE TRANSMITTER; Pieter de Lange and Robert Aernout Baron van Lynden, Utrecht, Netherlands. App. filed Feb. 29, 1921. Durable and able to stand great quantities of energy.

1,389,255. HIGH-FREQUENCY ELECTRICAL OSCILLATION APPARATUS; Leslie R. McDonald, Montreal, Quebec, Can. App. filed May 16, 1917. Oscillation apparatus for therapeutic use and for radio transmission.

1,389,306. PROTECTIVE ARRANGEMENT FOR ELECTRIC DISTRIBUTION SYSTEMS; Philip V. Hunter, Purley, England. App. filed March 1, 1919. Split-conductor system.

1,389,307. WATERPROOF ELECTRIC HEATER; Lee P. Hynes, Albany, N. Y. App. filed May 27, 1920. For car heating, etc.

1,389,312. ELECTRIC HEATER; Edwin M. Lightfoot, New York, N. Y. App. filed March 3, 1920. Flat electric heater having resistor mounted within but insulated from a sheet-metal casing.

1,389,326. SYSTEM OF ELECTRICAL DISTRIBUTION; William A. Turbayne, Niagara Falls, N. Y. App. filed June 15, 1916. Lighting of railway cars.

1,389,327 to 1,389,334 inclusive. SYSTEM OF ELECTRICAL DISTRIBUTION; Leonard A. Watson, Brooklyn, N. Y. App. filed Sept. 19, 1919. Improved railway-car lighting system.

1,389,342. PLANER AND SYSTEM OF MOTOR CONTROL THEREFOR; Harold L. Blood, Plainfield, N. J. App. filed March 15, 1917. Planers provided with reversing driving motor.

1,389,343. PANELBOARD STRUCTURE AND BRANCH-BLOCK UNITS; John Cuthbert and Julian J. Nielsen, Chicago, Ill. App. filed May 18, 1916. New and useful form of lamp receptacle.

1,389,351. MEANS FOR SUPPORTING ELECTRODES IN IONIC TUBES; Charles H. Harvey, London, England. App. filed May 27, 1918. Loop elastically supported by coiled spring.

1,389,354. METHOD OF AND MEANS FOR INCREASING POWER FACTOR; C. Hering, Philadelphia, Pa. App. filed June 18, 1914. For counteracting undesirable effects of inductance in an alternating-current circuit.

1,389,397. HEATER; Louis A. Tactikos; Greenwich, Conn. App. filed Jan. 23, 1920. For warming confection batches.

1,389,433. DRIVING MECHANISM FOR AUTOMATIC MACHINES; John P. Brophy, Cleveland, Ohio. App. filed Oct. 19, 1916. Machine in which number of operations can be carried on on a single piece of stock.

1,389,463. SYSTEM OF ELECTRICAL DISTRIBUTION; William A. Turbayne, Niagara Falls, N. Y. App. filed Nov. 15, 1915. Improved stone system of car lighting.

1,389,476. WELDING CAST IRON; Jack Churchward, New York, N. Y. App. filed Oct. 27, 1920. Welded joints which are adapted to be machined.

1,389,555. TARGET-FOLLOWING BOMB SIGHT; Bernard L. Smith, Washington, D. C. App. filed March 11, 1918. Carried by aircraft for co-operation between the pilot and the observer.

1,389,566. MAGNETIC FIRING MECHANISM FOR SUBMARINE MINES; Hudson Maxim, Hopatcong Borough, N. J. App. filed Dec. 7, 1917. Without contact between mine and vessel to be destroyed.

(Issued Sept. 6, 1921)

1,389,596. DESK OPERATOR'S CIRCUITS; William A. Rhodes, New York, N. Y. App. filed Dec. 5, 1918. For connecting subscriber's line with special position.

1,389,623. COMBINED SWITCHING AND PROTECTIVE UNIT FOR ELECTRICAL TRANSMISSION LINES; Russell T. Calloway, Chicago, Ill. App. filed March 29, 1920. For use in small pole-top installations.

1,389,625. ELECTRICAL SOLENOID; Alexander Churchward, New York, N. Y. App. filed June 24, 1919. Current-regulating apparatus for electric welding system.

1,389,628. BEVERAGE URN; Warren F. Clark, Cleveland, Ohio. App. filed Dec. 24, 1919. Electrically heated.

1,389,662. MEANS FOR TREATMENT OF PYORRHEA; John R. Irwin, Cobourg, Ontario, Canada. App. filed April 6, 1920. Electrochemical.

1,389,684. ELECTRIC HEATER; William A. Morrison and Frederick D. Lake St. Catharines, Ontario, Canada. App. filed Oct. 4, 1920. For use in hot-water boilers.

1,389,691. DRY-CELL ELECTRIC BATTERY; James E. Peavey, Cincinnati, Ohio. App. filed March 15, 1919. Absorbent packing between the anode forming casing of cell and the electrode.

1,389,716. ELECTRIC GENERATING SYSTEM; Roy M. Van Vleet, Milwaukee, Wis. App. filed June 14, 1920. Isolated electric generating plant.

1,389,718. TYPEWRITING MACHINE; John Waldheim, Elizabeth, N. J. App. filed Sept. 18, 1919. Automatic return.

1,389,740. SOCKET FOR TUBULAR LAMPS; Marc Chalier, Paris, France. App. filed July 10, 1914. Footlights or floats.

1,389,750. ELECTROLYTE FOR STORAGE BATTERIES; William Gardiner, Chicago, Ill. App. filed Aug. 22, 1918. Substantially dry storage battery.

1,389,773. TROLLEY-WIRE SUPPORT; Henry L. Miller, Knoxville, Tenn. App. filed Dec. 5, 1919. Cast and finished with minimum amount of machine work.

1,389,800. RADIO-SIGNALING APPARATUS; Roy A. Weagant, New York, N. Y. App. filed Feb. 1, 1918. Signals received from different directions without material static interference.

1,389,811. VENDING MACHINE; Eugene F. Bowen and Ephraim J. Scott, Providence, R. I. App. filed Sept. 15, 1920. For feeding stamps, tickets, coupons, etc.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BROOKLINE, MASS.—The town authorities have voted to appropriate $37,000 for improvements and alterations to the municipal lighting and heating plant and the installation of new equipment.

BRIDGEPORT, CONN.—The United Illuminating Company contemplates the installation of a machine shop in connection with its generating plant under construction at the foot of East Main Street. The shop will be equipped for electric machinery repairs, manufacture of parts, etc.

Middle Atlantic States

BUFFALO, N. Y.—The Niagara, Lockport & Ontario Power Company has filed a petition with the Public Service Commission by which the power company would acquire the stock holdings and interests of Almet and Sheldon N. Broadhead in the Jamestown Lighting & Power Company and the Western New York Electric Company. The Niagara company, it is understood, contemplates the erection of a transmission line from Dunkirk to Jamestown, subject to the approval of the above arrangement.

NEW YORK, N. Y.—Plans have been filed by the board of directors of the Mount Sinai Hospital, 110th Street and Fifth Avenue, for extensions and improvements to the power house at the institution.

NEW YORK, N. Y.—The Inwood Consumers' Ice Manufacturing Corporation, recently incorporated with a capital of $220,000 by N. F. Schmidt, 220 Broadway, and others, is contemplating the construction of an ice-manufacturing and refrigerating plant.

SILVER CREEK, N. Y.—The Silver Creek Electric Company has filed notice of an increase in capital stock from $20,000 to $40,000.

ELIZABETH, N. J.—Plans have been prepared for the erection of an addition to the power house in connection with an extension to the Battin High School.

OCEAN CITY, N. J.—The Board of Freeholders, Cape May, is considering extensions and improvements to its electric plant in Ocean City. M. D. Rice, Wildwood, is county engineer.

HAZLETON, PA.—Improvements to the street-lighting system in Hazelton are under consideration by the City Council. J. E. Altmiller is superintendent of highways and public improvements.

PHILADELPHIA, PA.—Bids will be received at the Department of City Transit about Oct. 31 for the construction of two substations, one 40 ft. x 60 ft., at Cumberland and Kensington Avenues, and the other, 40 ft. x 70 ft., at Griscom and Arrot Avenues. H. H. Quimby, 1211 Chestnut Street, is engineer.

PITTSBURGH, PA.—Arrangements have been made by the West Penn Power Company for an issue of $3,022,000 in bonds, the proceeds to be used for extensions and improvements.

SAYRE, PA.—Arrangements have been made by the Sayre Electric Company for an issue of $311,000 in bonds, the proceeds to be used for extensions, etc.

SCRANTON, PA.—Arrangements have been made by the Warren Light & Power Company for an issue of $212,500 in bonds and $30,000 in stock, the proceeds to be used for extensions, etc.

WEATHERLY, PA.—The Lehigh Valley Railroad Company, Wilkes-Barre, is considering replacing the steam power equipment at its frog shops at Weatherly with electrically operated machinery.

BALTIMORE, MD.—Bids will be asked by the Western Maryland Dairy Company, Linden Avenue and Dolphin Street, about

Oct. 1, for the installation of conveying equipment, transmission apparatus, etc., in its proposed new plant.

STEYER, MD.—Plans are under consideration by the Miners' Coal Company, recently organized with a capital of $500,000, for the installation of electrical and mechanical equipment at its properties. The company is also contemplating the erection of a power house and pumping plant. G. J. Lee is president.

BLUEFIELD, W. VA. — Arrangements have been made by the Appalachian Power Company for an issue of $2,500,000 in bonds, the proceeds to be used for extensions, improvements, etc. C. N. Mason is vice-president.

MORGANTOWN, W. VA. — The Star Glass Company has prepared plans for the construction of a plant to cost about $225,000 with machinery to replace its former works destroyed by fire. The present plans provide for main factory, 45 ft. x 500 ft., supplemented with a power house and other buildings. Louis Kauffield is manager.

MARION, VA.—Plans are under way for the construction of a new power house at the Southwestern State Hospital. Eubank & Caldwell, Express Building, Roanoke, are architects.

WASHINGTON, D. C.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for furnishing the following: Until Oct. 11, Boston, Schedule 8779—three electric heaters; Washington, Schedule 8812—20,000 ft. electric wire.

WASHINGTON, D. C.—Bids will be received by A. L. Flint, general purchasing officer of the Panama Canal, Washington, D. C., until Oct. 18, Circular 1459, for furnishing motion-picture projector, water meters, receptacles, reflectors, wire and cable, aero lightning switches, etc.

WASHINGTON, D. C.—Bids will be received at the office of the Chief Signal Officer, U. S. A., Washington, D. C., until Oct. 17, Circular PR 6840 A-1 CP, for furnishing 500 and 750 transmitters and receivers with loop, equipment box and battery cases f.o.b. to following destinations: 130 for South Brooklyn, N. Y.; 5 for Washington, D. C.; 10, Atlanta, Ga.; 75, Chicago, Ill.; 100, San Antonio, Tex.; 100, Fort Mason, Cal.; 20, South Brooklyn, packed for export; 35, Philadelphia, and 25 for Fort Mason, packed for export; also 250 for South Brooklyn. For further information address as above.

North Central States

GRAND RAPIDS, MICH. — Permission has been granted to the Wisconsin-Minnesota Light & Power Company by the Federal Power Commission for the construction of a hydro-electric power station on the Chippewa River, Sawyer County.

ASHTABULA, OHIO.—Plans are being prepared for the construction of a new municipal electric power plant in Ashtabula to cost about $400,000. Stone & Webster, 147 Milk Street, Boston, are engineers. M. H. Turner is city manager.

CINCINNATI, OHIO.—The Central Storage & Warehouse Company has acquired a building on Elm Street and plans to remodel it for a cold storage plant. The cost, with equipment, is estimated at $200,000.

CLEVELAND, OHIO. — The Cleveland Electric Illuminating Company has had plans prepared for the construction of a two-story addition, 26 ft. x 60 ft., to the substation on East Seventeenth Street. The cost is estimated at $40,000. M. S. Gallagher, Illuminating Building, is architect.

FREEPORT, OHIO.—The village authorities have granted a franchise to John F. Shreffler of Cleveland for the installation of an electric light and power station and ice plant in Freeport.

MIDDLETOWN, OHIO.—Bids, it is understood, will soon be received by City Clerk Kunz for the installation of an ornamental lighting system on East Third Street from Water Street to the Miami and Erie Canal.

CENTERTOWN, KY. — The installation of new equipment, including air compressors and other power apparatus, at the properties of the Blue Diamond Mining Company is under consideration. Robert A. Bridges is vice-president.

CORNISHVILLE, KY.—A company is being organized by Bishop Wash and associates to establish an electric light plant in Cornishville.

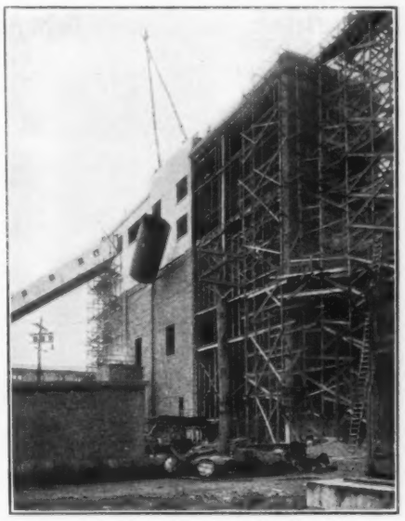
KENTENIA, KY.—The Banner Fork Coal Company is considering the construction of a power house at its properties and the installation of electric haulage and operating equipment at the mines.

KIEL, WIS. — The Kiel Woodenware Company, which supplies electricity to the city and industrial and domestic consumers, is contemplating an addition to its power plant. The company, it is understood, is in the market for additional generating transformer and other equipment.

NEENAH, WIS.—The City Council contemplates the installation of an ornamental lighting system on Wisconsin Avenue and Commercial Street to cost about $25,000. The present plans provide for 108 single-lamp standards and a two-circuit system. H. Zemlock is clerk.

SOLDIERS GROVE, WIS. — Plans are under consideration for rebuilding the hydro-electric generating plant and dam on the Kickapoo River, property of the Peterson Estate, to cost about $50,000. E. E. Dillon, Washington Building, Madison, is consulting and contracting engineer. Clarence Peterson is in charge of the estate.

KANSAS CITY, MO.—The Kansas City Power & Light Company is contemplating the installation of a substation at 1110-1" Baltimore Avenue. The machinery will



HOISTING STACK FOR NEW BOILER HOUSE OF FITCHBURG GAS & ELECTRIC COMPANY, JULY 2, 1921

cost about $250,000. The company also plans to install a substation at Fourteenth Street and Grand Avenue.

MEMPHIS, MO.—Bonds have been voted for the installation of a unit in the municipal electric light plant.

NEODESHA, KAN.—At an election to be held Oct. 11 the proposal to issue $195,000 in bonds for extensions and improvements to the light and water plant will be submitted to the voters.

Southern States

ASHEVILLE, N. C.—The Asheville Power & Light Company is having plans prepared for extensions and improvements to its plant. W. H. Plummer is manager.

HENDERSONVILLE, N. C.—Application has been made by the Blue Ridge Power Company for a franchise to supply electricity in Hendersonville.

PILOT MOUNTAIN, N. C. — The City Council is considering issuing bonds for the construction of a municipal power plant.

WALNUT GROVE, N. C. — Plans are being prepared for rebuilding the municipal electric plant recently destroyed by fire. M. T. Chilton, city commissioner, is in charge.

McCORMICK, S. C.—The City Council has granted the Paul B. Wilson Electrical Machine Works a franchise to supply electricity to the city.

JACKSON, MISS.—The State Board of Improvement is considering purchasing sixteen lighting plants for the state prison farms.

GRAVETTE, ARK.—H. D. Jenkins, Eureka Springs and Harrison, Ark., and R. A. Wilson, Harrison, are contemplating the establishment of a power plant in Gravette.

STUTTGART, ARK.—The City Council is considering the construction of an electric light plant in Stuttgart.

EL RENO, OKLA.—The installation of an ornamental lighting system in El Reno is under consideration.

FAIRFAX, OKLA.—Bonds to the amount of $80,000 have been voted for improvements to the lighting system and pumping station and for extending the water and sewer systems into the Tall Chief addition.

EL PASO, TEX.—The El Paso Electric Company has arranged for an issue of $750,000 in bonds, the proceeds to be used for extensions and improvements.

HARLINGEN, TEX. — Plans are under consideration for the construction of a municipal electric lighting plant to cost about $32,000.

Pacific and Mountain States

PORT TOWNSEND, WASH.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until Oct. 12 for the installation of a lighting plant, wiring, etc., at the U. S. Quarantine Station, Port Townsend, Wash. James A. Wetmore is acting supervising architect.

TACOMA, WASH.—The installation of a lighting system on South Eighth, Ninth and Tenth Streets has been authorized by the City Council.

TACOMA, WASH.—The installation of an ornamental lighting system on Sixth Avenue between State and Pine Streets, a distance of eight blocks, is under consideration by the City Council.

PORTLAND, ORE.—The Columbia Tire Corporation, it is reported, will soon award contract for the construction of a tire factory in the Kenton industrial district to cost about $100,000. The plant will be electrically operated, and motors of a total rating of from 600 hp. to 800 hp. will be required.

REEDSPORT, ORE.—The City Council is considering the establishment of a municipal lighting system in Reedsport.

LONG BEACH, CAL.—The Crystal Ice Company is planning the construction of a plant to cost about $45,000. C. H. Taylor is interested in the company.

LONG BEACH, CAL.—Plans are under way for the installation of an ornamental lighting system on Third Street between Pine and American Streets.

LOS ANGELES, CAL.—The installation of an ornamental lighting system in a section of Edgemont has been authorized by the Council.

TUJUNGA, CAL.—The formation of a street-lighting district in Tujunga has been authorized.

Canada

KINGSTON, ONT.—The construction of a power plant at the Kingston General Hospital is under consideration.

LONDON, ONT.—The rebuilding of the dam at Springbank is under consideration. E. V. Buchanan is manager of the Public Utilities Commission.

MERLIN, ONT.—The City Council is considering the establishment of an electric light and power system in Merlin to cost about $15,000. E. D. Lawler, 190 University Avenue, Toronto, is engineer.

NORTH TORONTO, ONT.—The Transportation Commission, Toronto, contemplates the construction of an automatic substation on Eglinton Avenue, North Toronto.

OTTAWA, ONT.—Bids, it is reported, will soon be received by the Board of Public Works, for the construction of a hydro-electric generating plant in the Fort Matachawan district. The plant will have an initial capacity of about 10,000 hp. The total cost is estimated at $500,000.

WILKESPORT, ONT.—The installation of an electric light and power system in Sombra Township is under consideration. E. D. Lawler, 190 University Avenue, Toronto, is engineer.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co., Birmingham, Ala.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, C. E. Drayer, 63 East Adams St., Chicago, Ill.

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Printed in the First Issue of Each Month

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